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ABSTRACT

The research reported here was designed to measure the abilities of school-age children to form and generalize "visual concepts" on the basis of their observation of prepared sets of art reproductions. The art reproduction sets displayed similarities based upon various visual attributes. Discrimination of the attributes common to any given set was taken as evidence of concept formation. Selection of similar reproductions in additional displays was taken as evidence of concept generalization. Additionally, tape-recorded discussions of the test administrations were analyzed. These discussions yielded additional evidence of successful test performance (on a verbal dimension) and were useful in describing the character of children's abilities to discuss the visual attributes of art reproductions. Evidence gathered indicates that students at all grades (except, possibly, kindergarten) are able to form visual concepts from their observation of selected sets of art reproductions. Subjects also successfully described their classification of observed visual similarities when discussing the items. Students at all grade levels are also able to generalize visual concepts to previously unencountered examples. Reliability indices, computed for both types of displays, were below minimum standards for tests used to evaluate individual performance. The obtained reliabilities were attributed to interactions of low item intercorrelations, test length, and the lack of experience among subjects with the tasks tested. (Author/CK)

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FINAL REPORT

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AN INVESTIGATION OF CHILDREN'S ABILITIES TO FORM AND GENERALIZE VISUAL CONCEPTS FROM VISUALLY COMPLEX ART REPRODUCTIONS

Gilbert A. Clark

The Ohio State University
128 No. Oval Drive
Columbus, Ohio, 43210

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Gilbert Clark
Columbus, Ohio

SUMMARY

The research reported here was designed to measure the abilities of school-age children to form and generalize "visual concepts" on the basis of their observation of prepared sets of art reproductions. The art reproduction sets displayed similarities based upon various visual attributes. Discrimination of the attributes common to any given set was taken as evidence of concept formation. Selection of similar reproductions in additional displays was taken as evidence of concept generalization.

Additionally, tape-recorded discussions of the test administrations were analyzed. These discussions yielded additional evidence of successful test performance (on a verbal dimension) and were useful in describing the character of children's abilities to discuss the visual attributes of art reproductions.

Evidence gathered indicates that students at all grades (except, possibly, kindergarten) are able to form visual concepts from their observation of selected sets of art reproductions. Subjects also successfully described their classification of observed visual similarities when discussing the items. Students at all grade levels are also able to generalize visual concepts to previously unencountered examples.

However, reliability indices, computed for both types of displays, were below minimum standards for tests used to evaluate individual performance. The obtained reliabilities were attributed to interactions of low item inter-correlations, test length, and the lack of experience among subjects with the tasks tested. Scores on the two tests correlated at a greater than .01 level, though both types of displays were being experimentally tested during this investigation.

Work is currently being undertaken to determine more accurate measurement of the abilities tested during this investigation.

INTRODUCTION

ART EDUCATION AND THE EDUCATION OF VISUAL OBSERVATION

"Matisse-ness" is a visual concept defined by all of the visual attributes common to the works of Henri Matisse. For those persons who hold the concept, "Matisse-ness" makes it possible to recognize previously unencountered works as those of the artist, to recognize Matisse-like aspects in works by other artists, and to apply the concept to other visual experiences. A visual concept like "Matisse-ness" is developed through observation of the artist's works and is refined through observation of the greatest possible number of works. Adults trained to sophisticated viewing are able to describe and criticize art objects formally, stylistically or aesthetically on the basis of their perception of visual concepts. But what do children see when they look at art reproductions? Can they learn visual concepts? Can they recognize "style?" Can they discern visual similarities in groups of visually complex art reproductions?

Some writers believe children are only cognizant of displayed attributes which they have previously experienced and been trained to observe (7, 14) or for which they have an appropriate vocabulary (30, 72). If these are the only bases for knowledgeable responses to observation, the visual act cannot be an immediate or direct means of learning. Other writers have suggested, however, that learning from visual stimuli need not be verbally mediated--that learning can result directly from observation experiences. Thus an important research question is raised: is it possible to demonstrate the learning of visual concepts by children as an immediate consequence of their observation of visually complex art reproductions?

ALTERNATIVE EMPHASES IN ART EDUCATION

The abilities to form and generalize visual concepts on the basis of observation are important to an emerging emphasis in school art curricula--the education of visual sensibility. Numerous writers have urged the teaching of art criticism in school art curricula (8, 10, 20, 22, 26, 50, 65, 72). Knowledgeable observation is the key to understanding the visual arts and criticism is based upon valid discrimination and analysis of the visual attributes of the art work to be criticized (4, 6, 9, 22, 35, 48, 54, 62, 68). Inevitably this visual sensibility is translated into verbal expression (as in published art criticism) but must be founded in knowledgeable observation. Thus visual sensibility is posited as critical to the learning of art criticism and to aesthetic responding to an art work. Though visual sensibility is an important aspect of general education (2, 11, 29, 48) and critical to a full participation in the visual arts (6, 9, 22, 28, 35, 54, 67), few school art curricula have emphasized this aspect of learning about the arts.

The single-minded attention to "creative" production that has characterized American art education for more than twenty-five years is being questioned by more and more educational theorists (8, 11, 24, 52, 62, 67, 71). The art experience most frequently offered in the schools is "making art," i.e., producing a product. But education for the visual and critical consumption of art should receive as much attention in art curricula as production activities. Proponents of the education of visual sensibility through art education have indicated many outcomes for which visual sensibility may be crucial. It has been proposed that art offers the best materials available for the analysis of complex form and the training of acute observation (5, 6, 11, 18, 47).

For art education, the most important claim is that visual sensibility is critical to appreciation and understanding of the arts (2, 8, 11, 20, 22, 26, 28, 32, 48, 57, 65, 68). Dressel and Mayhew (20) and Eitner (28) have pointed out that simple passive viewing of an art work is not sufficient to develop an understanding of the work. They claim an art work is understood by conscious and directed use of the senses and the mind. Thus Eitner (28), Johnson (47), and others (6, 11, 50, 63) suggest that teachers should educate learners to experience an art work visually, both globally and analytically.

Efforts to broaden the base of production dominated art education programs to include directed visual experiences are expressed in recent recommendations for curricula with emphases on art history (62, 65), aesthetics (8, 9, 70), and the skilled, analytic viewing of art (10, 26, 71). These curricula would require learners to observe art objects and analyze their visual attributes. From observation and analysis, the viewer may be educated to form visual concepts that are applicable to additional art experiences and objects. The measurement of visual sensibility (as investigated here) and the education of knowledgeable visual observation are basic to these newer directions in public school art education.

ANALYSIS OF CHILDREN'S VISUAL SENSIBILITY

On the basis of their observation of art reproduction, subjects of this investigation were asked to discriminate likenesses and differences, classify according to such likenesses and differences, or to generalize concepts by selecting additional exemplars. These abilities are necessary to the intellectual process of "concept formation" according to Dale Harris (41). That observed visual attributes can be formed into concepts was reported by Hull (44) in 1920. His research, in which subjects classified Chinese ideographic characters on the basis of visual observation, showed that subjects were able to distinguish class members from non-class members on the basis of visual clues. Many researchers have verified Hull's findings (13, 14, 15, 42, 66).

Numerous studies of concept formation and generalization have demonstrated and analyzed successful performance (7, 13, 14, 15, 32, 42, 45, 46, 60, 66). Most of this research used verbal cues and verbal reports by subjects. Yet, in his seminal writings on visual perception, J. J. Gibson (33, 34) has postulated that just as children are said to "think" when their sounds become symbols, a person can learn to think in terms of visual symbols. Gibson speculated that in certain respects such thinking may be performed more easily than verbal thinking. Research in audio-visual learning techniques has established that presentations in visual and verbal media evoke different connotative meanings (1, 21, 43, 59, 64). In addition, Gropper (36, 37, 38) has shown that visual presentations can teach concepts and that visual lessons can lead to performance on visual test items superior to that following verbal and visual/verbal mixed presentations.

In the realm of art, to recognize a Toulouse-Lautrec lithograph without noting the "signature" is to apply the visual concept of "Lautrec-lithograph-ness" in an act of visual generalization. An artists's personal style is observable across numerous art works. To recognize that style in additional work by the same artist, upon observation, is to generalize a visual concept, such as "Matisse-ness" or "Lautrec-lithograph-ness."

As this investigation sought an analysis of the visual sensibility of public school students, the procedures outlined were designed to be carried out with a minimum of verbalization by the researcher or subjects. This emphasis on non-verbal task performance derives from many sources. McFee (49, 50) differentiates visual concepts derived from form and surface elements of objects as seen in space and light (direct observation) and cognitive concepts derived from verbal review of past learning (mediated abstraction) (49). Similarly, Arnheim (2, 3, 4, 5, 6) discusses visual experience as a means of triggering concept learning. Arnheim postulates that visual observation is a mode of generalization by the viewer. Attneave (7) holds that visual information is processed before it reaches awareness and Garner (31) says that one does not passively receive, but actively perceives. As a test of these beliefs Arnheim has speculated that if subjects are shown a set of very different figures and asked to find some similarity, their differentiation of the percept will lead to the discovery of similarities and to subsequent generalization (3).

Hull (44), Smoke (66), Carpenter (15), and Heidbreder (42), have found that learners can identify concepts without being able to verbalize what they have learned. Many definitions of "concept" require verbal labelling as an aspect of concept formation. However, John B. Carroll (16) sees concepts as essentially nonlinguistic or alinguistic because conceptual recognition can occur without the guidance or prompting of "symbolic language phenomena" (16:311). Bruner (13, 14) has pointed out that one cannot derive the label for something by looking at it, though one can learn to recognize an image of something just by looking at the object. Thus careful consideration of concept learning suggests that attention should be paid to investigating observation as an immediate learning mode for visual concepts.

Visual sensibility is the ability to make a knowledgeable response to visual experience, i.e., to demonstrate learning as a consequence of visual experience. It has been shown that numerous writers have speculated on the appropriateness of extended visual experiences in school art curricula and that research findings conducted outside of art education have supported the feasibility of visual learning as a curricular experience. Because many writers believe art is based on visual experience, there is pressure to extend the art program to include directed visual experiences with art works and reproductions. Yet this type of curricular experience has not been extensively researched.

METHODS (1)

THE PROBLEM

This investigation was designed to study children's responses to the tasks of forming visual concepts on the basis of observed visual similarities among sets of art reproductions and of generalizing visual concepts to additional art reproductions. Public school students in the kindergarten, third, sixth, ninth, and twelfth grades were shown two types of research items. In one procedure, subjects were shown displays of nine reproductions. They were asked to find seven visually similar reproductions and to eliminate the remaining two. This procedure was carried out entirely without discussion following the administration of two training items. In another procedure, subjects were shown displays of six reproductions. They were asked to determine visual similarities common to all six reproductions. Following their examination of each display (which was no longer in view), they were shown a display of three additional reproductions and asked to indicate one reproduction exhibiting the greatest visual similarity to the set previously examined. Two-thirds of the subjects carried out this procedure without discussion following the administration of two training items. One-third of the subjects verbalized their search for attribute similarities and these verbal responses were tape-recorded.

Recognition of visual similarities and their classification into a defensible "set" was taken as evidence for formation of a visual concept. Selection of a visually similar reproduction from each selection display was taken as evidence for generalization of a visual concept. The taped discussions of items furnished evidence of the ability of children to verbalize their solutions to these tasks; the number and range of attributes named in these discussions were examined.

DEVELOPMENT OF THE VISUAL DISPLAYS

The displays designed for this study are based upon the investigator's experience with largely non-verbal teaching devices (Attribute Games and Problems (29)) and participation in a curriculum project in which educating visual sensibility was a major goal (Stanford-Kettering Project (26)).

Attribute Games and Problems (29) are a set of teaching devices developed by Elementary Science Study to improve thinking skills. Students classify and investigate relationships between classes by manipulating physical materials. An Attribute Game named "Creature Cards" was used indirectly as a model for the visual displays in this investigation (Figure 1). Creature Cards display

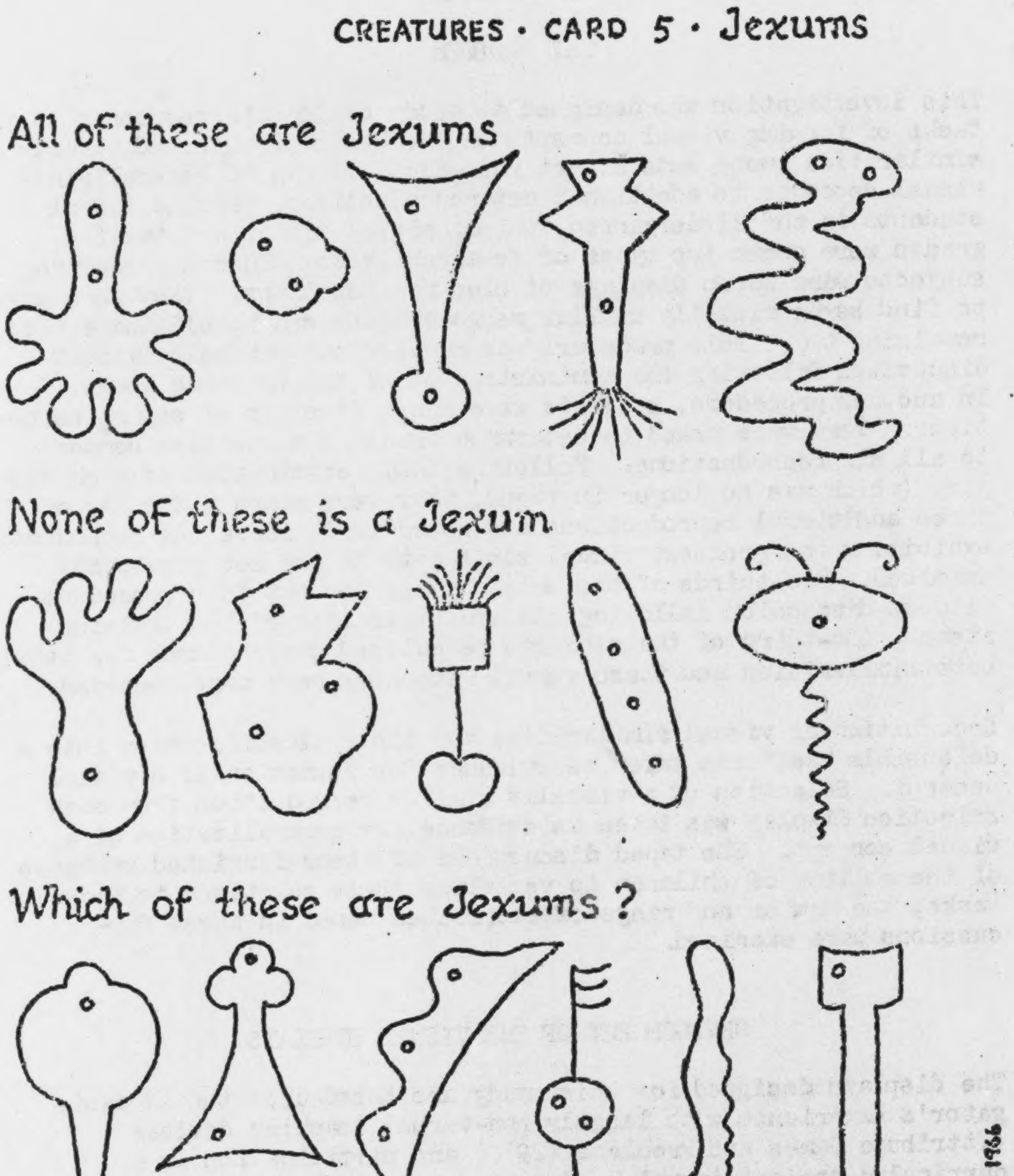
CREATURES · CARD 5 · Jexums
All of these are Jexums
None of these is a Jexum
Which of these are Jexums?
©ESI 1966

Fig. 1.--Creature Card: "Jexums."

several related line drawings which are "named" with a nonsense word. These line drawings can be considered to define "visual concepts"; the defining characteristics of the concepts are visual. If one understands the task, the label is superfluous; the selection may be shown by pointing to exemplars or covering non-exemplars without verbalization of the task.

In 1968 the author was a participant and writer for the Stanford-Kettering Project (26) and conceived the need for measuring children's abilities to respond knowledgeably to the visual attributes of art objects. This elementary art curriculum makes extensive use of art reproductions and the curriculum designers assumed that students were able to "read" the visual attributes of art reproductions if they were to participate meaningfully in many of the lessons (27). Elliot Eisner was the Stanford-Kettering Project director. His own research into the knowledge and attitudes about art found among secondary and college-level students indicates that few students are prepared to cope knowledgeably with even "low level" measures of art information (25). The Stanford-Kettering Project was designed in large part to teach students to make knowledgeable responses to the observed attributes of art reproductions included as curriculum materials.

Visual Attributes of Art Objects. Many viewers confront an art object largely in terms of its perceived moral, sentimental or decorative attributes (73). Few people attend to the more basic visual attributes which are of greater importance to a knowledgeable response to an art object (22, 23, 24, 48, 54, 59). Meaningful aesthetic experience demands the abilities to discriminate, classify and generalize visual attributes observed in art objects (22, 54, 57). When one confronts an art object there are different types of attributes that can be known through observation. The following list of observable attributes is based upon similar constructs developed by Wilson (72) and others:

1. Material: the type(s) of physical matter used in the original such as pencil, water color, plaster, wood, etc.

2. Technical: the particular method(s) of production such as serigraphy, woodcutting, casting, modeling, painting, etc., as well as how the techniques were used.

3. Subject matter: the image(s) depicted and their resemblance to objects exclusive of the art object. In objective art the subject matter is usually recognizable as "things" depicted, whereas in non-objective art the subject matter is the combination of other visual attributes.

4. Formal: the visual skeleton of the art object--its internal structure. Color, line, shape, texture, space, and com-

position and their inter-relationships are formal attributes.

5. Symbolic: the meanings ascribable to iconic images within the art object in terms of the culture in which the object was created.

6. Thematic: the pervasive quality, feeling, or meaning conveyed by imagery and formal attributes of the object. The thematic attributes of an art object may be observed objectively.

7. Physiognomic or Expressive: the subjective emotional reaction, feeling or meaning engendered in the viewer as a reaction to viewing the art object.

8. Historical: the observable properties which make possible the identification of art objects, their assignment into stylistic categories, and their presumptive dating.

The first four types of visual attributes require less subtle observation than the remaining four. Therefore, the first four, categorized as Objective Attributes by the writer were the basis for the design of visual displays. Subjective Attributes are less likely to be agreed upon by experts, since their recognition requires sophisticated identification, analysis, and interpretation (22).

THE VISUAL GENERALIZATION DISPLAYS

Twenty-two Visual Generalization items were used: two were used to familiarize subjects with the testing procedure and data were recorded for the remaining twenty. Contents of the Visual Generalization items are listed in Appendix I. Each Visual Generalization item consists of two displays. A "Concept Display Sheet" (CDS) presents six art reproductions selected as exemplars of a visual concept. The visual concept on any CDS is defined by the visual attribute or complex of attributes observable in all six of the reproductions. For example, the six Cubist reproductions shown in Figure 2 are similar in (a) technique, (b) line, (c) shape, and (d) composition, and also in their thematic, expressive, and historical attributes. A viewer can recognize any one of these common attributes, without attending to the others, and still classify the reproductions as similar.

Subjects were directed to look at all six CDS reproductions of a training item carefully. They were asked to "tell how they all look alike...Try to see as many ways as you can." After the subject had named a minimum of two similarities they were asked, "Do you see any other ways they all look alike?" Following the responses to this question, the page was turned and a Generalization Selection Sheet

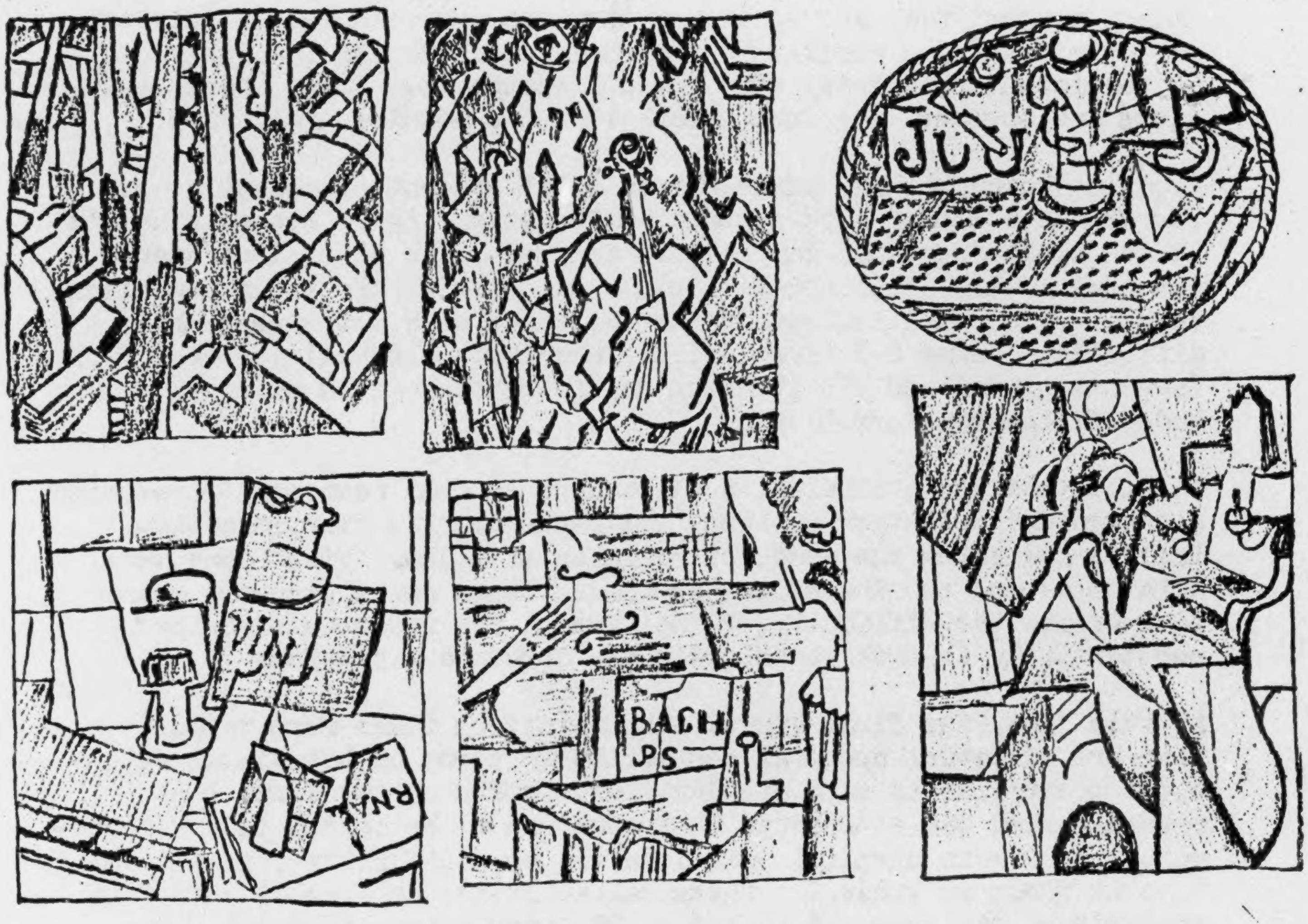

Fig. 2.--Concept Display Sheet BB

(GSS) shown. The subjects were directed to look at GSS reproductions carefully and choose the one that looked most like the pictures on the previous CDS. After the two training items were completed, the subjects worked through the 20 remaining items, first examining the item's CDS and then, by turning a page, passing onto the item's GSS and marking their choices on standardized answer sheets.

Scoring is based on visual similarities between CDS and GSS reproductions. Two points are scored for selection of the reproduction which shares the greatest number of CDS visual attributes. Selection of a reproduction which shares only some of the CDS visual attributes is scored one point and selection of a visually dissimilar reproduction is scored as zero. For example, when each of the reproductions in

Figure 3 is compared with the CDS of Figure 2, the following are apparent: Choice (A), line and technique are similar to the CDS exemplars; Choice (B), line, technique, material, subject matter, shape, composition, and secondary thematic, expressive, and historical attributes are similar to CDS exemplars; Choice (C), there is no consistent similarity with the CDS exemplars. Thus, these selections are scored: (A), one point; (B), two points; (C), zero.

A pilot instrument was administered to 35 students in elective art courses at a senior high school and 36 junior high school students in the single required general art course. The pilot instrument was administered individually to the subjects within their own classrooms. Pilot data indicated that the tasks were not unreasonably difficult. Using 0-1 (wrong-right) scoring, reliabilities of .69 (seventh grade) and .53 (twelfth grade) were obtained using the Kuder-Richardson Formula #20.

The obtained reliabilities, a clustering of item response frequencies at "popular" selection options, and generally low discrimination indices indicated the need for revision of items. Five items were eliminated and ten items were revised. These revisions were meant to increase the difficulty of the items. Two items were revised substantially in order to clarify the concepts displayed.

At this time, the final Visual Generalization items were rated by five art education doctoral candidates in terms of the visual attributes observable on each display. On a standardized form, the raters marked the attributes they observed to be common to the reproductions in each display. The inter-rater reliability for each attribute is shown in Table I. These reliabilities were calculated from analysis of variance and showed a .99 inter-rater agreement. The degree of agreement attests to the objectivity of the scoring keys used for the research instruments.

THE VISUAL CONCEPT FORMATION DISPLAYS (VCF)

An additional instrument was constructed at this time with the same content as the Visual Generalization Displays, but with a different format. For each VGD item, all CDS and GSS reproductions were arranged and mounted on single sheets (Figure 4). During the administration of these Visual Concept Formation Displays, subjects were told that "seven of these pictures look alike in some way." The subject's task was to "cover up two pictures (with blank cards) so that all the pictures not covered look alike." Scoring was keyed to the Visual Generalization Displays. Elimination of the two GSS distractors was scored two points. Elimination of one Visual Generalization distractor (plus some other reproduction) was scored one point. If the subject covered two of the CDS exemplars, zero was scored. Each administration could yield a range of 0 - 40 points.

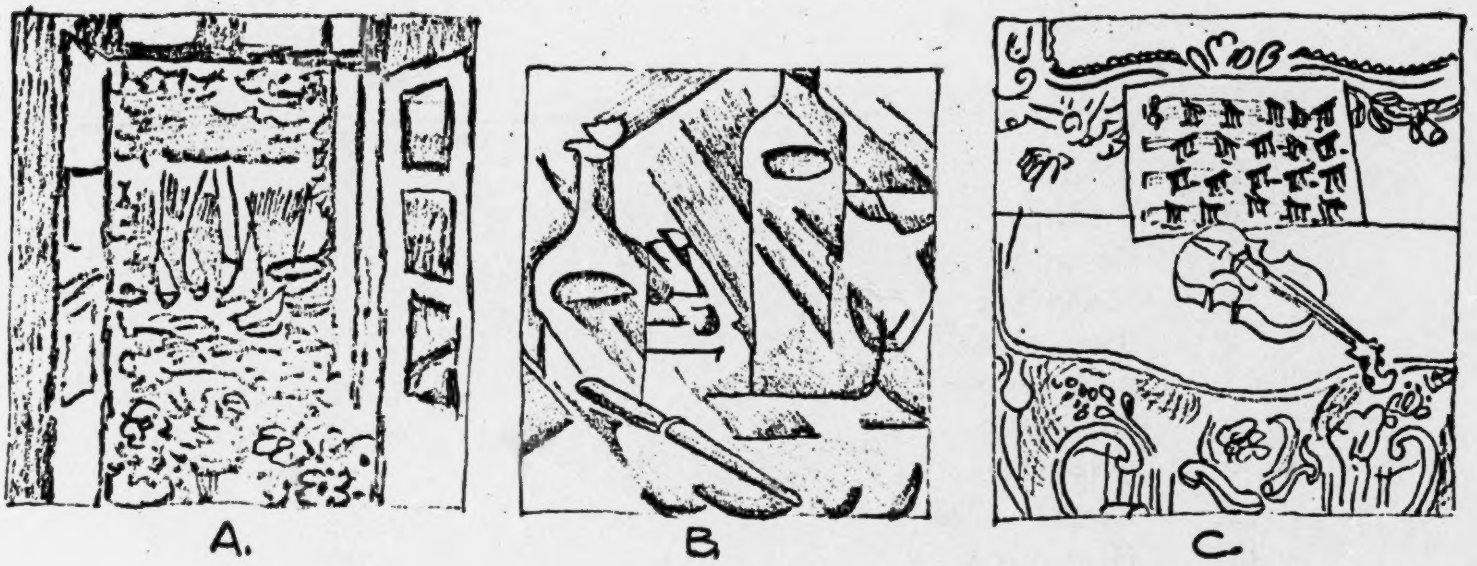

Fig. 3.--Generalization Selection Sheet BB

There are 22 Visual Concept Formation Displays--two training items and 20 research items. The visual concepts in this instrument are defined by any visual attribute or combination of visual attributes common to seven of the reproductions and absent in the distractors. Contents of the Visual Concept Formation Displays are listed in Appendix II.

Successful performance on the two tests rests on a complex of abilities. The Visual Concept Formation Displays required subjects to attend to nine visually complex reproductions. Among the visual

TABLE I

AGREEMENT OF RATERS REGARDING THE PRESENCE OF VISUAL ATTRIBUTES IN VISUAL GENERALIZATION ITEMS

Visual attribute categories		Inter-judge reliability
1.	Color	.98
2.	Line	.98
3.	Form	.99
4.	Composition	.97
5.	Material	.97
6.	Technical	.99
7.	Subject Matter	1.00
8.	Symbolic	.69
9.	Thematic	.98
10.	Expressive	.95
11.	Historical	.97
12.	Overall Style	.98
	Total across categories	.99

complexities (array of attributes displayed) subjects must discriminate those critical attributes which occur on seven of the reproductions and are absent on two. To facilitate this task visually, subjects used two blank cards, moving them over the reproductions. During administration of this test, the administrator marked the answer sheet.

The Visual Generalization Displays presented a different set of tasks. Subjects were shown six reproductions and told to look for visual similarities. Among the visual complexities displayed, subjects had to discriminate those critical attributes common to all six reproductions and eliminate (or ignore) attributes which occurred on less than six reproductions. At his discretion, the subject then turned the page (thus eliminating the six reproductions from view). He had to hold a visual or verbal memory of the critical attributes to apply to the selection display. On the selection page the subject viewed three additional reproductions. Among these,

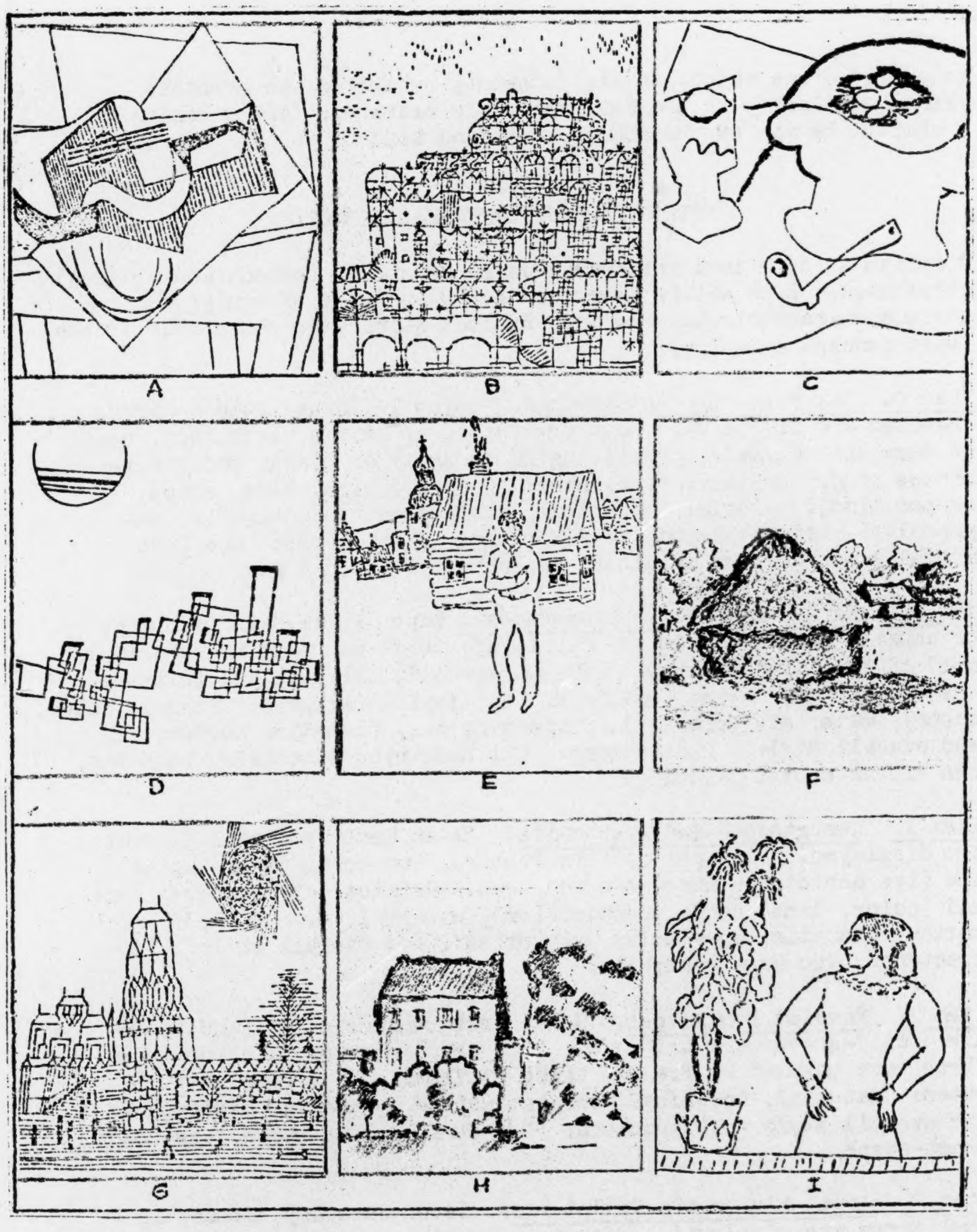

Fig. 4.--Visual Concept Formation Display AA

he selected one which, in his judgment, exhibited the greatest visual similarity to the set previously examined. After making a choice, he marked the answer sheet and went on to the next item.

ATTRIBUTES OF THE VISUAL DISPLAYS

Displays in both visual instruments share identical content and critical attributes. Each set is described below in terms of its gross, obvious characteristics and the critical attributes observable in the seven concept exemplars:

Item 0. Lautrec: Circus Drawings. Seven Toulouse-Lautrec circus drawings are displayed. Each drawing is of circus performers, most of them with animals, practicing in an empty or nearly empty European circus ring. Critical attributes: formal (color, line, shape, composition), material, technical, subject matter, thematic, expressive, historical and overall style. Distractors: One Marc animal painting, one Kandinsky non-objective painting.

Item 00. Marc: Animals in Landscapes. Seven Franz Marc paintings of animals in landscapes are displayed. Each painting is of animals, most of them are of horses. The backgrounds are stylized (expressionist and cubist) natural settings. Critical attributes: formal (color, shape), material, technical, subject matter, thematic, historical, and overall style. Distractors: One deChirico surrealist painting, one Villon cubist painting.

Item 1. Rembrandt: Self-Portraits. Seven Rembrandt self-portraits are displayed. Each portrait is frontal, two begin at the waist and five depict the shoulders and head. Critical attributes: formal (color, line, shape, composition), material, technical, subject matter, thematic, expressive, historical, and overall style. Distractors: Two Goya portraits.

Item 2. Fauvist Landscapes. Seven post-impressionist (and Fauve-like) city-scapes are displayed; four are harbor or lakeside towns. Three were painted by Braque, three by Vlaminck. Critical attributes: material, technical, subject matter, thematic, historical, and overall style. Distractors: One Utrillo city-scape, one Monet beach-scape.

Item 3. Arp: Biomorphic Sculptures. Seven Jean Arp biomorphic sculptures are displayed. Each is a curvilinear single figure on a stand. Critical attributes: formal (line, shape, composition), material, technical, subject matter, thematic, expressive, historical, and overall style. Distractors: One Moore biomorphic sculpture, one Giacometti sculpture.

Item 4. DeChirico: Surrealistic Landscapes. Seven surrealistic landscapes by Giogio deChirico are displayed. Each is a stylized arrangement of buildings and assorted figures and objects. The perspective is distorted but commonly central. Critical attributes: formal (color, line, shape, composition), material, technical, subject matter, symbolic, thematic, expressive, historical, and overall style. Distractors: One Braque landscape, one Margritte surrealistic painting.

Item 5. Brown Color Predominance. Seven paintings from different schools and periods are displayed. The surface of each painting is 60-90% brown color. Critical attributes: formal (color). Distractors: One Miro fantasy painting, one Chagall portrait.

Item 6. Moore "Reclining Figure" Sculptures. Seven reclining figure sculptures by Henry Moore are displayed. The figures are metal, stone, or wood and three are fractionated into two or three parts. Critical attributes: formal (line, shape, composition), subject matter, thematic, historical, and overall style. Distractors: One Rodin sculpture, detail of one Michelangelo sculpture.

Item 7. Cezanne: Landscapes. Seven landscapes by Paul Cezanne are displayed. Each is infused with considerable light and most have buildings in the background. Critical attributes: formal (color, line, shape), technical, subject matter, thematic, expressive, historical, and overall style. Distractors: One Utrillo landscape, one Monet landscape.

Item 8. Modigliani: Portraits. Seven portraits of adults and children by Amedeo Modigliani are displayed. All but one are seated, all against a similarly colored background and all have their hands folded or clasped in front. Critical attributes: formal (color, line, shape, composition), material, technical, subject matter, thematic, expressive, historical, and overall style. Distractors: Two Matisse portraits of seated individuals, one with arms folded.

Item 9. Chinese Landscapes. Seven historically "classical" landscapes by Chinese artists are displayed. All combine sky, mountains, trees, and structures (buildings or bridges) in a typically oriental use of space. Four have obvious ideographic characters. Critical attributes: formal (color, shape), material, technical, subject matter, symbolic, thematic, historical, overall style. Distractors: one Chinese portrait, one Chinese bird painting.

Item 10. Horizontal Composition. Seven paintings from diverse schools and periods are displayed. The arrangement of elements are compositionally horizontal. Critical attributes: formal (composition). Distractors: One Utrillo city-scape, one deChirico surrealistic painting.

Item 11. Central Vanishing Point Perspective. Seven post-impressionist paintings are displayed. A central, receding perspective, most often emphasized by a centered roadway between buildings, dominates the arrangement of elements. Critical attributes: formal (shape, composition), subject matter. Distractors: One Vlamick landscape, one Utrillo church painting.

Item 12. Russion Icons. Seven Russion Icons by anonymous painters are displayed. All depict religious themes. Five are complex compositions of several figures--two are portraits of saints. Critical attributes: formal (color, line, shape), subject matter, symbolic, thematic, historical, and overall style. Distractors: One Romanesque portrait of saints, one Indian miniature.

Item 13. Cubist Still Lifes. Seven Cubist table arrangement still-lifes are displayed. Braque, Picasso, and Gris are the painters represented. Many objects are depicted in the paintings. Critical attributes: formal (line, shape, composition), technical, subject matter, thematic, expressive, historical, and overall style. Distractors: One Matisse still-life, one Marc animal painting.

Item 14. Nicholson: Still Lifes. Seven still-life paintings by Ben Nicholson are displayed. All paintings depict heavily linear eating and drinking utensils. Critical attributes: formal (color, line, shape), material, technical, subject matter, thematic, historical, and overall style. Distractors: One Braque still-life, one Klee fantasy painting.

Item 15. Staël: Expressionist Paintings. Seven highly abstracted paintings by Nicolas De Staël are displayed. The paintings are heavily textured with paint, filled with large color areas and intense in color. Critical attributes: formal (line, shape), material, technical, historical, and overall style. Distractors: Two Klee fantasy paintings.

Item 16. Blue Color predominance. Seven paintings of dissimilar content are displayed. The paintings share only two critical attributes. The paintings are predominantly blue (in various shades) with small area, warm color highlights. Critical attributes: formal (color), material. Distractors: One Chagall landscape, one Utrillo city-scape.

Item 17. Van Gogh: Landscapes. Seven paintings by Vincent Van Gogh are displayed. Less commonly seen works by this popular artist were selected. Five depict towns or towns and nearby country side. Two depict fields and hills. Critical attributes: formal (line), material, technical, thematic, historical, and overall style. Distractors: One Monet landscape, one Utrillo city-scape.

Item 18. Circular/Oval Forms. Five paintings and two bas-relief sculptures are displayed. The art objects are constructed of circular and oval forms (some within rectangles). The subject matters and other attributes are totally dissimilar. Critical attributes: formal (shape and composition). Distractors: One Mondrian drawing, one Kandinsky painting.

Item 19. Divided Horizontal Composition. Seven paintings with an obvious compositional attribute are displayed. Each painting is divided horizontally into two distinct color areas. The foreground and backgrounds (two color areas) are interrupted with narrow vertical elements. Critical attributes: formal (composition). Distractors: Two Buffet city-scapes.

Item 20. Triangular composition. Three paintings and four sculptures are displayed. The art objects all depict the human figure either as full figure or bust. Outward thrown arms, shoulders and head of the forms depicted all contribute to a triangular composition in each object. Critical attributes: formal (composition), subject matter. Distractors: One detail of a Michelangelo sculpture, one Picasso portrait sculpture.

Following completion of the instrument development and pilot testing reported in this chapter, the research displays were administered to public school students in five grades. Design of the investigation is discussed in the following section.

METHODS (2)

DESIGN OF THE INVESTIGATION

Students from primary through secondary grades in the Livermore Valley Unified School District, Livermore, California, were tested. The investigation was carried out in an elementary and a secondary school chosen by the district as having similar student populations. At the elementary level all students in each participating class were tested. At the secondary level subjects were recruited by members of the high school staff from various classrooms and from the school library.

The Visual Generalization Displays were administered to 275 subjects enrolled in kindergarten and the third, sixth, ninth, and twelfth grades. Both the VGD and the Visual Concept Formation Displays were administered to 89 subjects. Thus data were collected from 364 test administrations (Table II).

Livermore, site of the University of California Lawrence Radiation Laboratory, has a high proportion of professional and technically trained individuals. The sample for this investigation reflected this proportion (Table III). A further indication of the high socioeconomic status of the sample was the distribution of wage earners within each family. School records or subjects' responses designated 203 female parents (78%) as "housewife." There were 51 families (18%) in which both parents were wage-earners and six female parents were part-time employees (2%).

Subjects' ages, calculated to the month in which the investigation was conducted, ranged from 66 to 232 months (Table IV). The average range per grade was 25.6 months. Lorge-Thorndike IQs were available for all subjects above the third grade (Table IV). IQ scores determined in the fifth and eighth grades were available for subjects presently attending the sixth, ninth, and twelfth grades; they ranged from 70 to 149.

PROCEDURES

A table of random numbers was used to assign elementary school subjects to the administration of the Visual Concept Formation Displays and to a tape-recorded administration of the Visual Generalization Displays. Subjects from the secondary grades were randomly assigned to "stations" as they entered the testing room. One third of the subjects at each grade were assigned to a tape-recorded VGD administration and one-third were assigned to VCF administration. Twenty-nine subjects were assigned to both of these testing procedures.

Elementary. The Visual Generalization Displays were administered to

TABLE II

NUMBER OF SUBJECTS PARTICIPATING IN EACH TESTING MODE

Grade	Number tested on Visual Generalization Displays	Number Tape Recorded on 10 VGD Items	Number tested on Visual Concept Formation Displays (as well as VGD)
K	55	20	10
3	52	21	24
6	55	19	20
9	58	16	19
12	55	17	16
Total	275	93	89

elementary school subjects in their regular classrooms. All students in two classes at each grade were tested during normal classroom activities and schedules. The Visual Concept Formation Displays were later administered to a random third of the students. Data from class rosters (name, date of birth, age, sex, school, grade, and instructor) were filled in on each answer sheet prior to testing by the test administrators. Adaptations of the Visual Generalization protocol were made at the kindergarten level. Kindergarten subjects discussed each display with the administrator and encouraging comments of "Yes," "Good," "O.K.," or "That's right" were used following each comment and selection made by students. These adaptations were thought to be necessary to maintain the attention and interest of subjects in kindergarten. In addition, the administrator marked the answer sheet for each kindergarten subject.

Secondary. The displays were administered to ninth and twelfth

TABLE III

DISTRIBUTION OF SUBJECTS ACCORDING TO OCCUPATION OF PRINCIPAL FAMILY SUPPORTER

*Socio-economic Index for Occupations	Number	Percent	Description of Occupational Categories
81 - 100	78	28.4	Professionals & kindred workers
61 - 80	72	26.2	Managerial & kindred workers'
41 - 60	41	14.9	Craftsmen & kindred workers
21 - 40	36	13.1	Sales clerks & kindred workers
1 - 20	41	14.9	Laborers & kindred workers
Data not available	7	2.5	
Total	275	100%	

*Socio-Economic Status values derived from Reiss: Occupations and Social Status (61).

grade subjects in a faculty conference room. After the investigation was introduced to the group to be tested, each subject filled in information blanks on the answer sheet and reported their parents' occupations on the reverse side. A test administrator worked with one of the subjects tape recording verbal responses to the Visual Generalization Displays. Two subjects administered the Visual Generalization Displays to themselves. A second test administrator worked with a subject who had been administered the VGD two to four

TABLE IV

CHARACTERISTICS OF SUBJECTS IN EACH GRADE

Grade	Sex	Number	Age Range (1)	Age Mean	IQ Range (2)	IQ Mean	SES Range (3)	SES Mean
K	M	25	67-83	73.6	N.A.(4)		19-86	63.3
K	F	30	66-86	72.8	N.A.		18-86	65.8
3	M	27	102-120	109.1	N.A.		9-86	58.9
3	F	25	98-118	106.5	N.A.		9-86	59.7
6	M	30	137-153	143.7	70-142	114.0	8-86	62.2
6	F	25	128-157	142.2	84-139	109.1	33-86	65.9
9	M	26	165-185	178.9	77-149	110.5	7-93	50.9
9	F	32	172-185	172.7	87-124	105.3	5-92	44.0
12	M	28	196-232	215.1	85-133	105.0	9-92	52.6
12	F	27	195-220	212.7	87-130	106.1	10-92	57.2

(1) Age: reported in months.
(2) I.Q.: Lorge-Thorndike Intelligence Test Scores.
(3) SES: Reiss: *Occupations and Social Status* (61).
(4) N.A.: not available.

days previously, administering the Visual Concept Formation Displays.

TREATMENT OF THE DATA

Three forms of data were collected: (A) Visual Generalization Display responses for 275 subjects, (B) Visual Concept Formation Display responses for 89 subjects, and (C) tape recordings of the discussion of ten Visual Generalization items by 93 subjects. Characteristics recorded for all subjects included birth date, sex, grade, parental occupations and, when available, IQ and standardized reading scores.

Nine five-inch reels of tape-recorded test administrations were transcribed. These transcriptions were analyzed following a simple category system in which each comment made by a subject, in a single word or phrase, was categorized as referring to an observable visual attribute or not. The visual attribute categories were the same as those previously presented: formal (color, line, shape, composition), material, technical, subject matter, symbolic, thematic, expressive, historical and overall style.

After the above data sources were coded they were processed for analysis. The results of the analyses are presented in the following section.

RESULTS

FINDINGS OF THE INVESTIGATION

This investigation required subjects to discriminate visual similarities among sets of art reproductions, classify the reproductions according to such similarities (form visual concepts) and generalize visual concepts to additional art reproductions on the basis of observed visual similarities. These tasks were designed to investigate educable abilities basic to children's visual sensibility. Subjects' performance of these tasks will be reported in relation to the following questions:

1. Can children form a visual concept by observing similarities in a selected set of art reproductions?

2. Can children generalize a visual concept by applying observed similarities among art reproductions to a previously unencountered example?

3. What attributes of visually similar art reproductions are most frequently noted by children?

4. What is the nature of children's verbal responses to the task of classifying observed visual similarities of selected sets of art reproductions?

5. Are the abilities to form and generalize visual concepts a function of grade level, age, SES, IQ, or sex of the subject?

1. Can children form a visual concept by observing similarities in in a selected set of art reproductions?

Two sources of data bearing on children's abilities to form visual concepts were collected during the investigation. The first was subjects' performance on the Visual Concept Formation Displays. The second source was transcriptions of subjects' verbal responses on being asked how the Visual Generalization Display CDS reproductions were visually alike.

The Visual Concept Formation Display responses were scored zero, one or two points, with a chance score of 8.9 for twenty displays* in a possible range of 0 - 40 points. Table V presents Visual

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* $(7/9 \cdot 6/8 \cdot 0 + 7/9 \cdot 2/8 \cdot 1 + 2/9 \cdot 7/8 \cdot 1 + 2/9 \cdot 1/8 \cdot 2)\ 20$

TABLE V

SUMMARY STATISTICS FOR VISUAL CONCEPT FORMATION DISPLAYS

Grade	Number	Range*	Mean	Standard Deviation
K	10	7-19	11.50	4.03
3	24	14-29	22.96	4.03
6	20	16-28	22.00	3.77
9	19	15-33	20.32	4.71
12	16	16-38	23.94	5.86
All Grades	89	7-38	21.04	5.68

* Maximum score = 40.

Concept Formation Display means and standard deviations for scores obtained at each grade. Most of the 89 subjects administered the Visual Concept Formation Displays scored above the chance level. The kindergarten mean (11.50) is 2.6 points greater than would be expected from random responding. All successive grade means exceed 20 and all subjects beyond kindergarten scored above the chance level. The third grade mean (22.96) is nearly double the kindergarten mean but represents a "plateau" along which the successive grade means fall. The sixth, ninth, and twelfth grade means (22.00, 20.32, and 23.94, respectively) indicate little measured growth in the abilities required to perform this task. Above kindergarten, the area within one standard deviation ± the mean at each grade includes the region of the mean at every other grade. Despite this similarity of scoring, there are qualitative differences discussed below.

VGD test administrations were tape recorded for 93 subjects. Subjects indicated a verbal classification (formed and expressed a visual concept) on the basis of their observation of visual similarities for 763 (82%) of the displays. To the remaining 18% subjects responded with silence, questions, or other indications of difficulty in verbalizing a concept. In other words, most attempts to describe a classification of the visual attributes were successful in this procedure. This finding is consistent with the scores on the VGD to be discussed below.

Both data sources reported above indicate that the majority of subjects tested (above kindergarten) demonstrated success in forming visual concepts (classifying common visual similarities observed in sets of art reproductions).

Discussion:

Table VI presents Visual Concept Formation Display means for each item at each grade tested. Figures 5 and 6 present two aspects of the data in Table VI. The effect of the number of common critical attributes observable in the displays can be seen in Figure 5. Subjects at every grade above kindergarten scored highest on displays exhibiting ten-twelve critical attributes. The displays exhibiting one, two, or three critical attributes were the most difficult. Only twelfth grade subjects (mean = .88) seemed generally able to discriminate the few common critical attributes of these displays. Figure 6 presents item means in a different grouping of displays. Displays in which artistic style did not figure (Group G) were the most difficult at each grade. Displays of one artist in a single style (Group F) and of several artists, in a single, common style (Group E) were considerably less difficult. However, the grade means on these two groups of items indicate little change from the third to the twelfth grades. Particular characteristics in each display also served to distract or mislead subjects. An examination of the responses to several displays will be reported to explicate visual factors which guided responses.

Displays #1 and #7 required discrimination of a single style but were "difficult"; scores on these items were below the average score for all items. Responses to these displays are shown in Figure 7. In display #1 elimination of the reproductions A and F was assigned two points. Elimination of A or F with any other reproduction was assigned one point. Reproductions A and F are two Goya portraits among seven Rembrandt self-portraits. The Goya portrait F (differing in color, stance of the figure and overall style) was eliminated by a majority of the subjects at each grade above kindergarten. However, the Goya portrait A (similar in color and technique but differing in stance and composition) was eliminated by a diminishing number of subjects in grades above kindergarten. Reproduction D is a Rembrandt self-portrait painted in an oval, whereas the other reproductions are rectangular. This obvious difference, despite the reproduction's internal similarity to the other Rembrandt portraits, increasingly distracted subjects throughout

TABLE VI

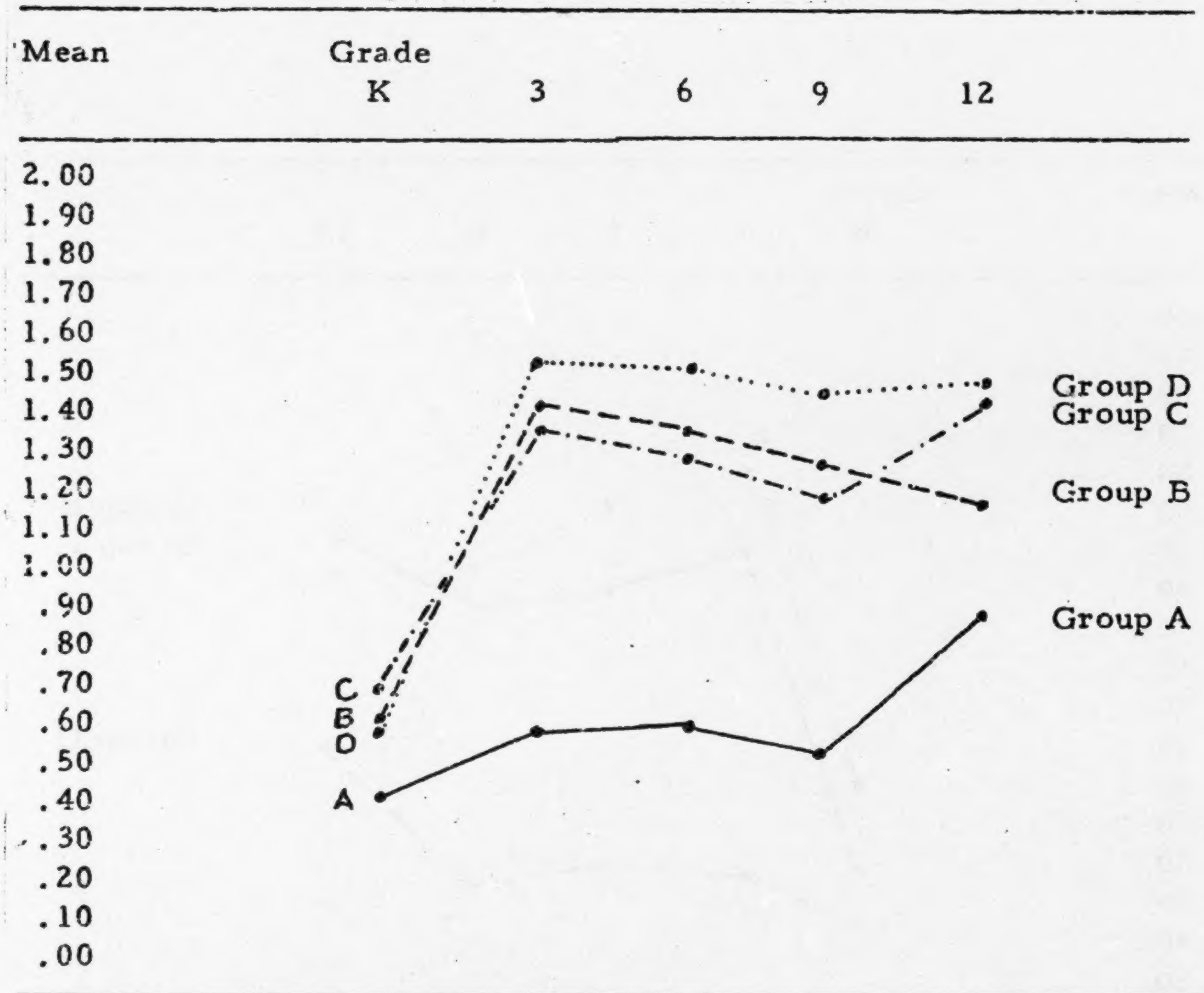
VCF ITEM MEANS TABULATED BY GRADE

Item	K N=10	3 N=24	6 N=20	9 N=19	12 N=16	Total N=89
1	.40	1.13	1.00	.95	.81	.92
2	.80	1.88	1.65	1.32	1.19	1.46
3	.70	1.58	1.85	1.74	1.75	1.61
4	.80	1.79	1.65	1.63	1.81	1.62
5	.80	.95	1.10	.58	1.00	.90
6	.50	1.21	1.30	.84	1.38	1.10
7	.60	.58	.65	.74	1.38	.78
8	.50	1.63	1.45	1.47	1.50	1.40
9	1.20	1.83	1.70	1.74	1.13	1.58
10	.10	.46	.50	.26	1.00	.48
11	.60	.83	1.00	1.00	1.13	.91
12	.50	1.46	1.15	1.16	1.31	1.19
13	.70	1.33	1.45	1.16	1.63	1.30
14	.60	1.79	1.45	1.47	1.63	1.48
15	.40	1.63	1.40	1.42	1.31	1.34
16	.10	.38	.45	.79	.88	.54
17	.70	.96	1.00	1.00	.94	.94
18	.90	1.08	.95	.58	1.00	.91
19	.40	.00	.15	.00	.56	.18
20	.20	.46	.15	.47	.62	.39

Underlining designates greatest mean per item.

Maximum score per item = 2.00.

the grades. Display #7 required discrimination of similar line, color, shape, and technique among seven Cezanne landscapes. The distractors are landscapes by Monet (D) and Utrillo (I). Selection D, with heavy impasto technique, is most unlike the Cezanne works. This reproduction was eliminated with increased frequency through the grades. Selection I was eliminated by the majority of subjects at the twelfth grade. Cezanne reproductions E, H, and A (which drew many responses) displayed distracting dissimilarities. Reproduction E was more darkly colored and depicted a more shallow space than the other landscapes; H, though similar in style and color, depicted a foreground "screen" of tree trunks; A depicted a large



Group A: One to three critical attributes.
Items #5, 10, 11, 16, 18, 19, 20.

Group B: Four to six critical attributes.
Items #2, 15, 17.

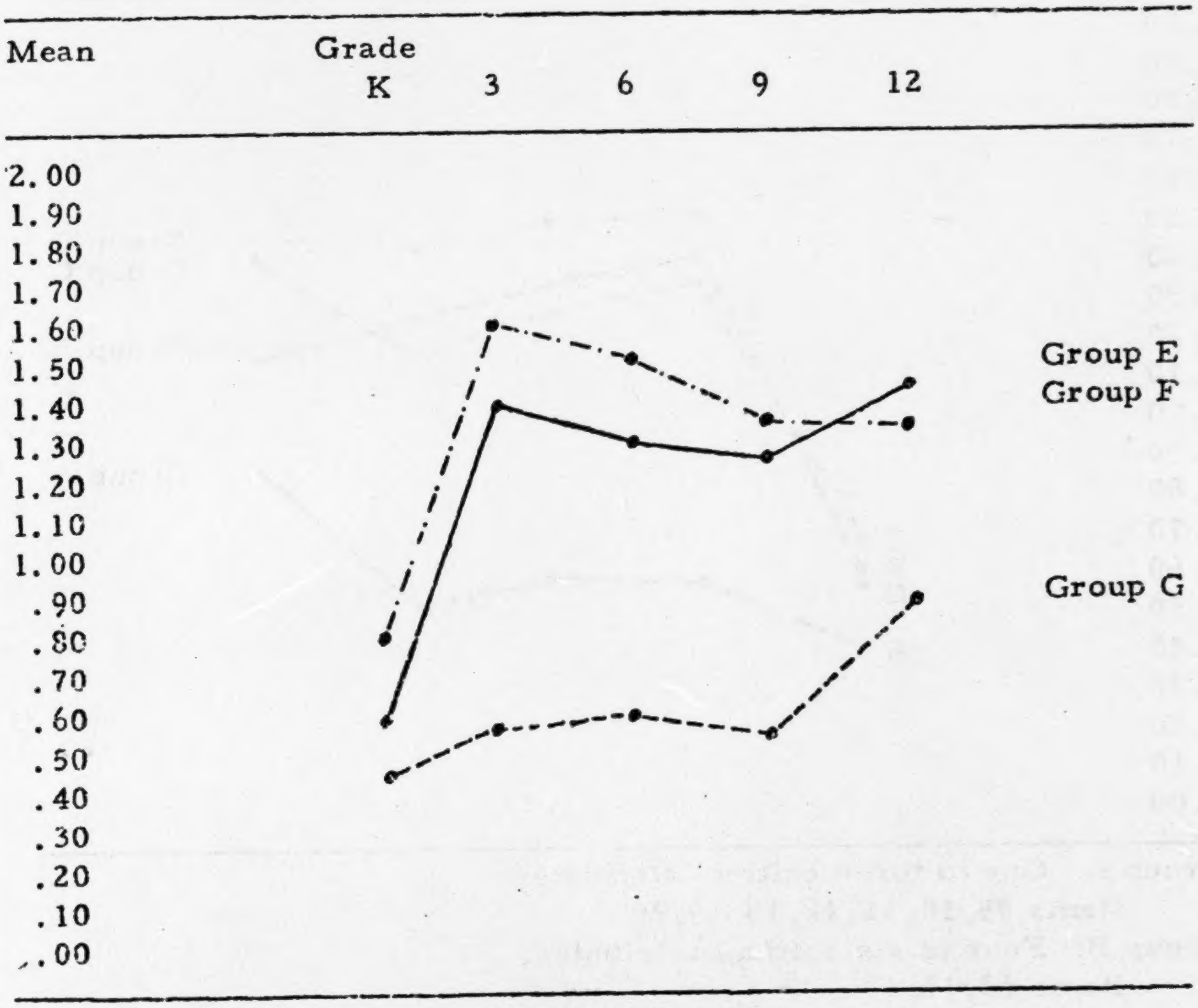
Group C: Seven to nine critical attributes.
Items #6, 7, 9, 12, 13, 14.

Group D: Ten to twelve critical attributes.
Items #1, 3, 4, 8.

Fig. 5.—Visual Concept Formation Item Means Grouped by the Number of Critical Attributes in Each Display.

expanse of water, richly blue, unlike the other reproductions. Rather than attending to internal, stylistic attributes common to several reproductions, many subjects appeared to be distracted by readily apparent subject matter dissimilarities of single reproductions.

Displays #4 and #9 required discrimination of a distinctive style



Group E: Displays of one artist, one style.
Items #1, 3, 4, 6, 7, 8, 14, 15, 17.

Group F: Displays of several artists, one style.
Items #2, 9, 12, 13.

Group G: Displays of attributes independent of style.
Items #5, 10, 11, 16, 18, 19, 20.

Fig. 6.--Visual Concept Formation Item Means Grouped by Type of Display.

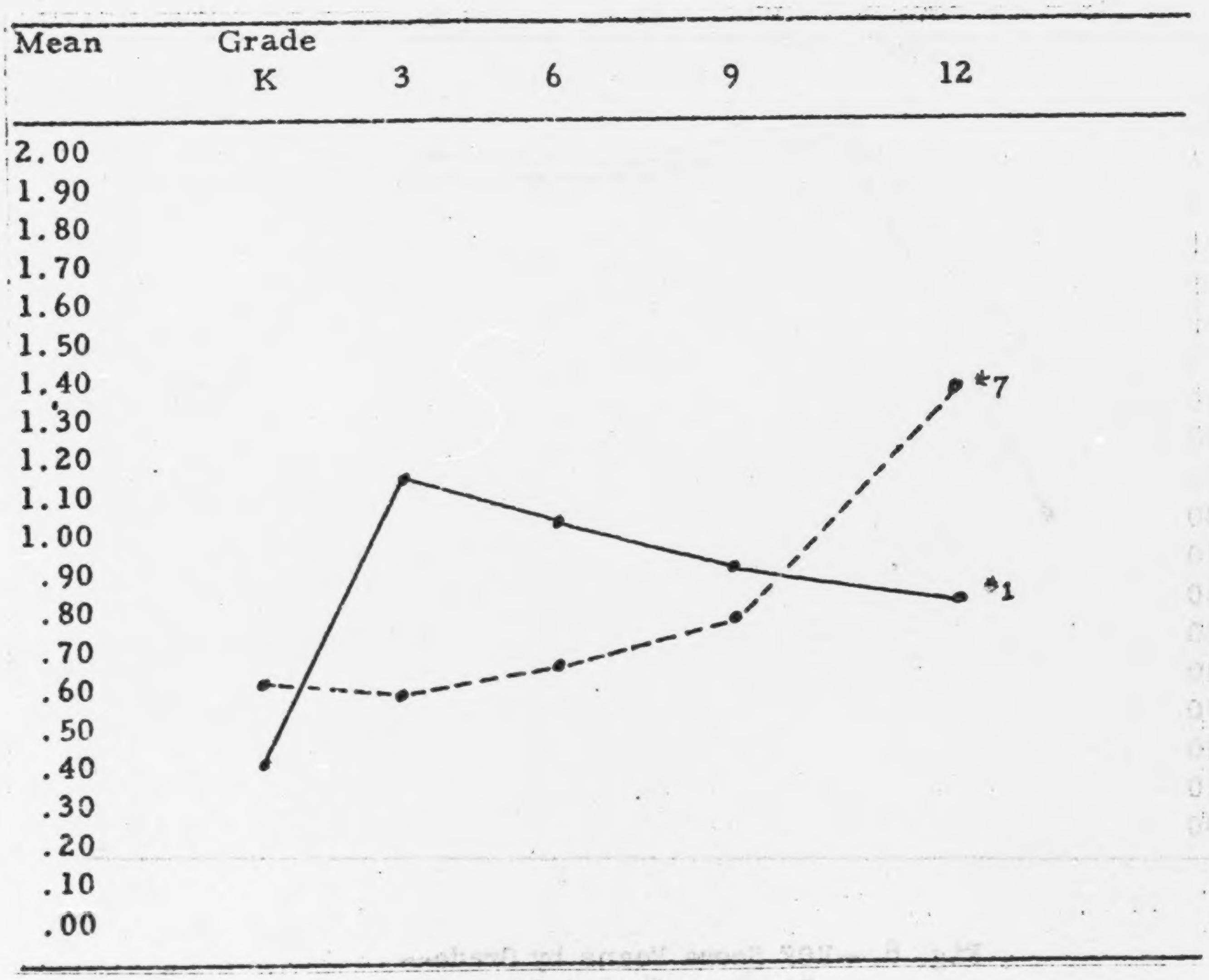


Fig. 7.--VCF Score Means by Grade--
Displays #1 and 7.

and were "easy"; scores on these items were above the average score for all items. Responses to these displays are shown in Figure 8. Display #4 consists of seven DeChirico surrealistic city-scapes with typical hard line, ominous color, and distorted central perspective. The distractors (B by Monet and G by Braque) are similarly colored but differ in content and style. Distractor B was eliminated by the

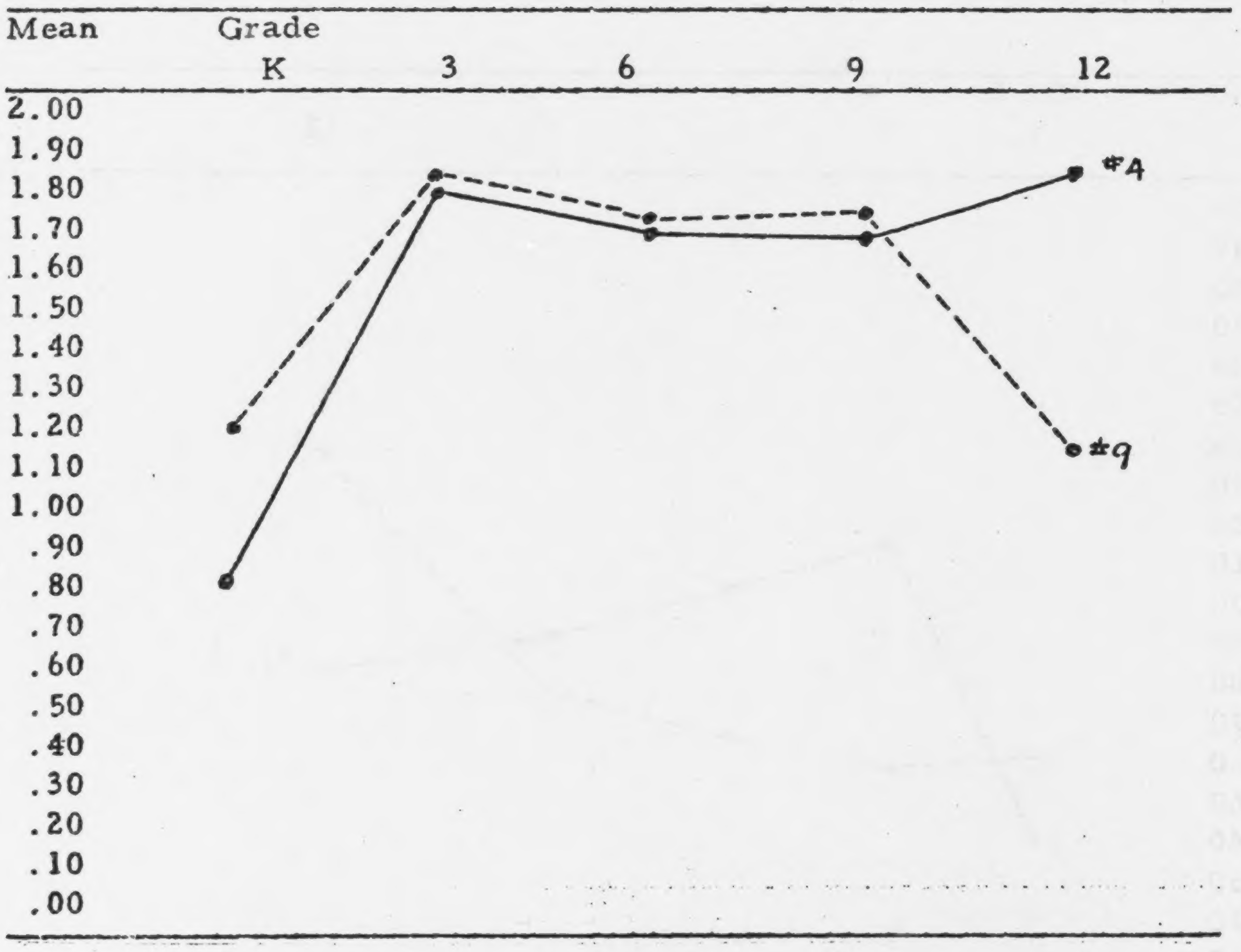


Fig. 8.—VCF Score Means by Grade—Displays #4 and 9.

majority of subjects above kindergarten. Similarly, distractor G was recognized as dissimilar by the vast majority of subjects beyond kindergarten. Reproduction D, with images of two large "artichokes" filling the foreground space, was eliminated by some subjects at each grade. The large foreground figures, missing in the other reproductions, apparently served to distract subjects who eliminated reproduction D. Display #9 exhibited seven landscapes by Chinese artists and two distractors: E, a nature study of two birds on a branch and H, a full length portrait. All reproductions were brush paintings on fabric by Chinese artists. Among the landscapes there are two (D and F) which are oval, unlike the rectangular form of the other reproductions. The majority of subjects in all grades above kindergarten eliminated the non-landscapes E and H. Reproductions D and F were not eliminated by any subjects in the kindergarten and third grades, but by an increasing number of subjects in the higher grades. Again, it appears the upper grade subjects were distracted by an obvious difference (external form) and attended less well to the internal attributes of the reproductions.

Display #11 required the discrimination of a central receding perspective as a compositional attribute among seven reproductions with similar content and style. Display #16 required the discrimination of a blue color predominance among seven reproductions of highly divergent content and style. Responses to these displays are shown in Figure 9.

The distractors in Display 11 (A and F) were painted at the same time in basically the same style as the examplar reproductions, so the compositional attribute was the most critical one. A majority of sixth, ninth, and twelfth graders eliminated one or both of the two distractors. Distractor A was eliminated by many subjects at each grade. Distractor F was more popular.

Many responses indicate a strategy of "pairing" (selecting a pair of visually similar reproductions rather than eliminating two reproductions unlike the remaining seven). In Display #11 the pair BF was similar in content, color, composition, and style. This pair distracted subjects at every grade above kindergarten. Similarly, the pair GF distracted subjects at every grade except the third.

Display 16 is one of two items requiring the discrimination of a color predominance (the single critical attribute) in reproductions that were otherwise different in content and style. The difficulty of this type of item was demonstrated by a wide diversity of responses and the low scores attained at each grade. The distractors (D and E) are two landscapes with diverse coloration (D) and grey-green color predominance (E). The color value of both distractors is similar to the seven predominantly blue reproductions on the page. Distractors D and E were eliminated by an increasing number of subjects in the successive grades, though never by a majority.

Some Visual Concept Formation Display subjects used a strategy which reduced their score. As the discussion of displays #9 and #11 indicates, some of the visual displays contained one to four visually similar "pairs." Rather than cover two reproductions unlike the remaining seven, some subjects covered pairs of visually-alike reproductions. There were 255 responses (14%) of this kind. All of the more difficult displays showed greater "pair" selection. This finding seems to indicate that pairing was a secondary response which subjects resorted to when the more correct selections were not readily apparent.

Some ability to form visual concepts on the basis of observed visual similarities among art reproductions, without apparent verbal

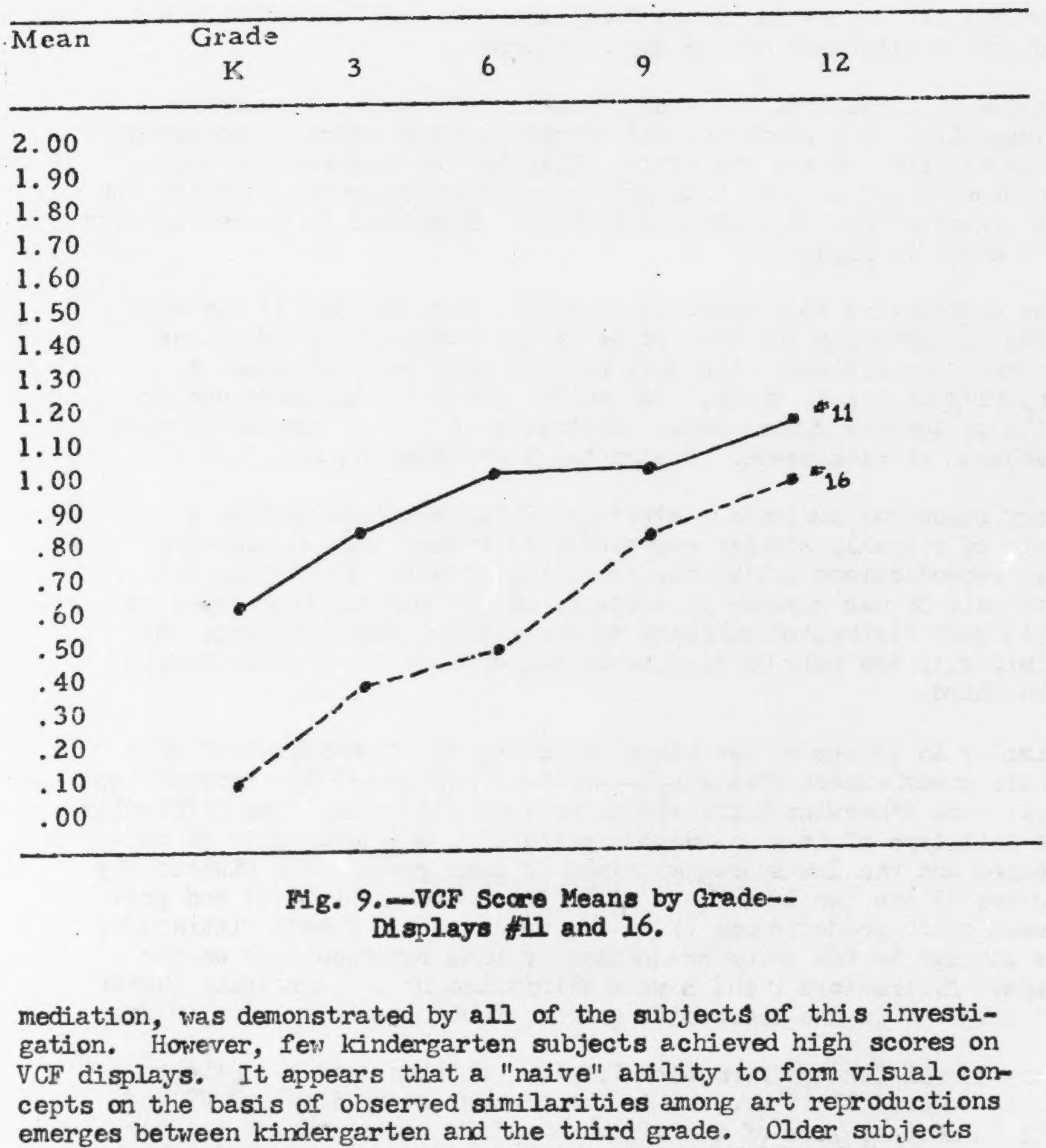


Fig. 9.—VCF Score Means by Grade— Displays #11 and 16.

mediation, was demonstrated by all of the subjects of this investigation. However, few kindergarten subjects achieved high scores on VCF displays. It appears that a "naive" ability to form visual concepts on the basis of observed similarities among art reproductions emerges between kindergarten and the third grade. Older subjects performed less well on easy items, being distracted by obvious attributes—subject matter or the "frame" of the reproductions. Displays based upon style with similarly styled distractors and displays based upon attributes independent of style and with the least number of critical attributes were most difficult to classify.

2. Can children generalize a visual concept by applying observed similarities among art reproductions to a previously unencountered example?

During administration of the Visual Generalization Displays twenty displays of six visually similar art reproductions were observed by subjects. The subjects were asked to classify the reproductions on the basis of visual similarities and subsequently to select a visually similar reproduction displayed with two distractors (generalize a visual concept).

Table VII presents means and standard deviations for each grade tested. Of 275 subjects administered the Visual Generalization Displays, all but one kindergarten subject scored above the chance level of 20* in a possible range from 0-40 points. The data incicate that the majority of subjects in all grades tested were able to discriminate and classify visual similarities and generalize them to previously unencountered art reproductions. However, there is only modest improvement of the abilities relevant to the generalization tasks during the years of schooling past the third grade.

Discussion:

The Visual Generalization Display scores improve modestly across grades. This finding appears to be affected by item difficulty and design of the displays. At all grades, item scores were negatively skewed, indicating the tasks were performed easily by the majority of subjects (51). At the upper grades many items failed to probe the upper limits of the ability of subjects to generalize visual concepts.

Table VIII presents Visual Generalization Display means for all grades tested. The mean score per display at each grade was: Kindergarten, 1.33; third, 1.52; sixth, 1.59; ninth, 1.62; and twelfth, 1.70. Success was greatest for those displays which exhibited the greatest number of critical attributes (Figure 10), a distinctive style (Figure 11), and the least similar distractors. Those which were least conducive to success were the displays exhibiting one to three critical attributes (Figure 10) and based upon critical attributes independent of an artistic style (Figure 11). An examination of the results with several sets of displays grouped by performance patterns will be reported to explicate other aspects of the scoring.

Displays in which a distinctive style was shown were discriminated, classified, and generalized by such large percentages of subjects (above kindergarten) that little across-grade improvement could be seen. This scoring pattern is presented for Displays #8 and #13 in Figure 12.

Displays showing a less distinctive style and using very similar distractors and two of the displays based upon attributes independent

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* $(1/3 \cdot 0 + 1/3 \cdot 1 + 1/3 \cdot 2)\ 20.$

TABLE VII

SUMMARY STATISTICS FOR THE VISUAL GENERALIZATION TEST

Grade	Number	Range	Mean	Standard Deviation
K	55	20-34	26.76	2.67
3	52	25-36	30.25	2.50
6	55	25-37	31.84	2.99
9	58	26-38	32.33	2.45
12	55	29-38	34.11	2.31
All Grades	275	20-38	31.08	3.58

Maximum score = 40.

of style showed the greatest mean score increase across grades. This scoring pattern is presented for displays #7 and #18 in Figure 13.

The displays based upon discrimination, classification, and generalization of attributes independent of an artistic style and exhibiting the least number of critical attributes were the most difficult for all subjects. Many of these displays showed little score increase across grades and the means clustered near mid-range. This scoring pattern is presented for displays #5 and #19 in Figure 14.

It appears that the abilities required to make the generalizations called for by this instrument do exist in the student sample. However, the absence of any significant improvement in performance after third grade suggests that these abilities are not deployed much more effectively by twelfth graders than by third graders. Above grade six the variance decreased as increasing numbers of subjects neared the effective "ceiling" of the test.

3. What attributes of visually similar art reproductions are most frequently noted by children?

TABLE VIII

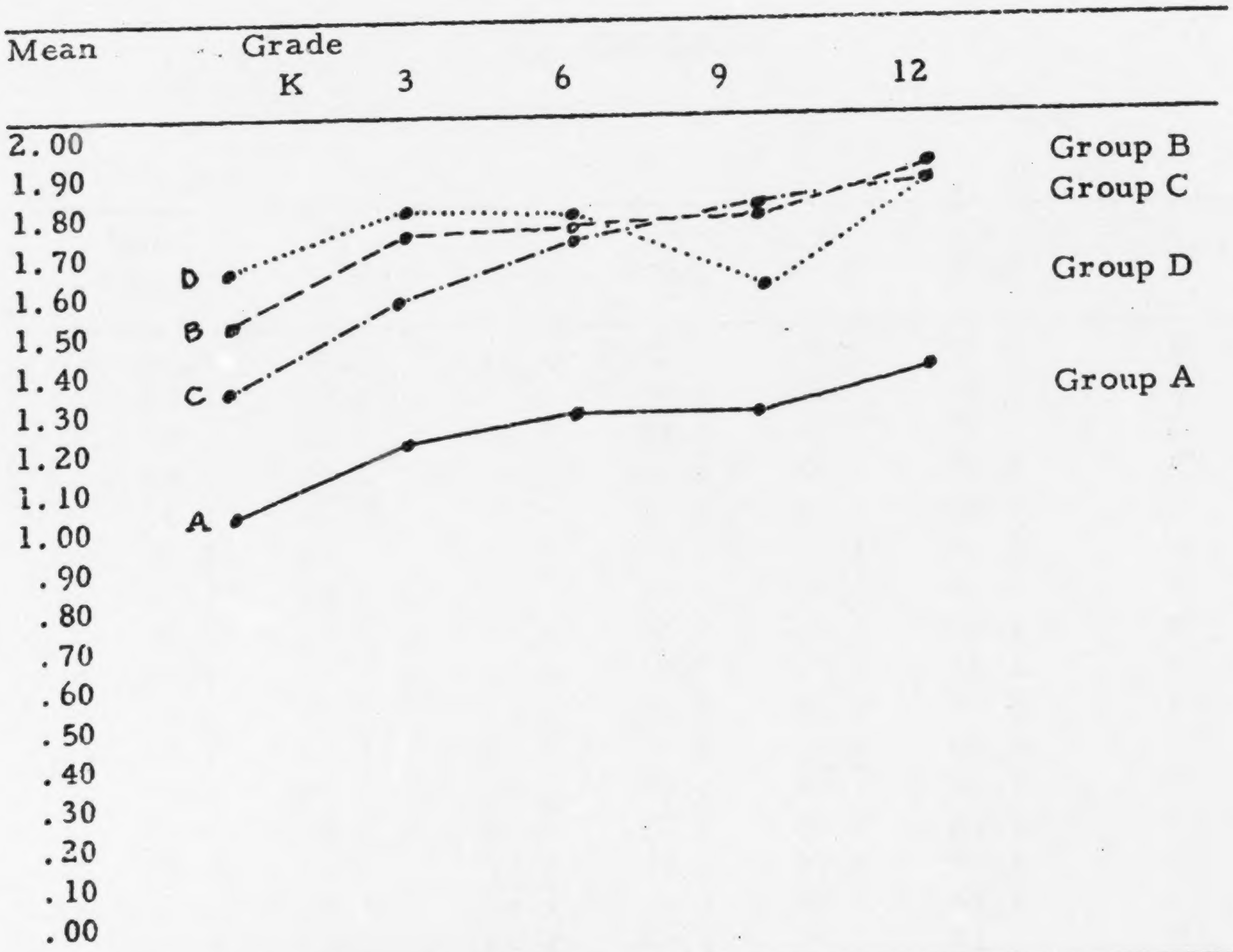
VGD ITEM MEANS TABULATED BY GRADE

Display	K N=55	3 N=52	6 N=55	9 N=58	12 N=55	Total Sample
1	1.43	1.60	1.25	1.34	1.49	1.42
2	1.85	1.87	1.93	1.91	1.91	1.89
3	1.89	1.96	1.98	1.86	1.96	1.93
4	1.71	1.73	1.96	1.97	2.00	1.88
5	1.09	1.08	1.00	1.31	1.35	1.17
6	1.04	1.12	1.36	1.64	1.62	1.36
7	1.31	1.21	1.75	1.67	1.84	1.56
8	1.65	1.85	1.89	1.93	1.98	1.86
9	1.87	1.71	1.95	1.91	1.96	1.88
10	0.75	0.88	0.76	0.66	1.00	0.81
11	0.75	1.17	1.07	1.00	1.05	1.01
12	1.40	1.85	1.82	1.88	1.85	1.76
13	1.05	1.69	1.85	1.84	2.00	1.69
14	1.49	1.79	1.78	1.95	1.89	1.78
15	1.76	1.92	1.95	1.84	1.91	1.88
16	1.15	0.98	1.36	1.43	1.60	1.31
17	1.00	1.46	1.40	1.60	1.80	1.45
18	1.18	1.52	1.75	1.66	1.80	1.58
19	1.27	1.40	1.45	1.48	1.56	1.44
20	1.11	1.46	1.56	1.43	1.55	1.42

Underlining designates largest mean on each display.

Maximum score per item = 2.00.

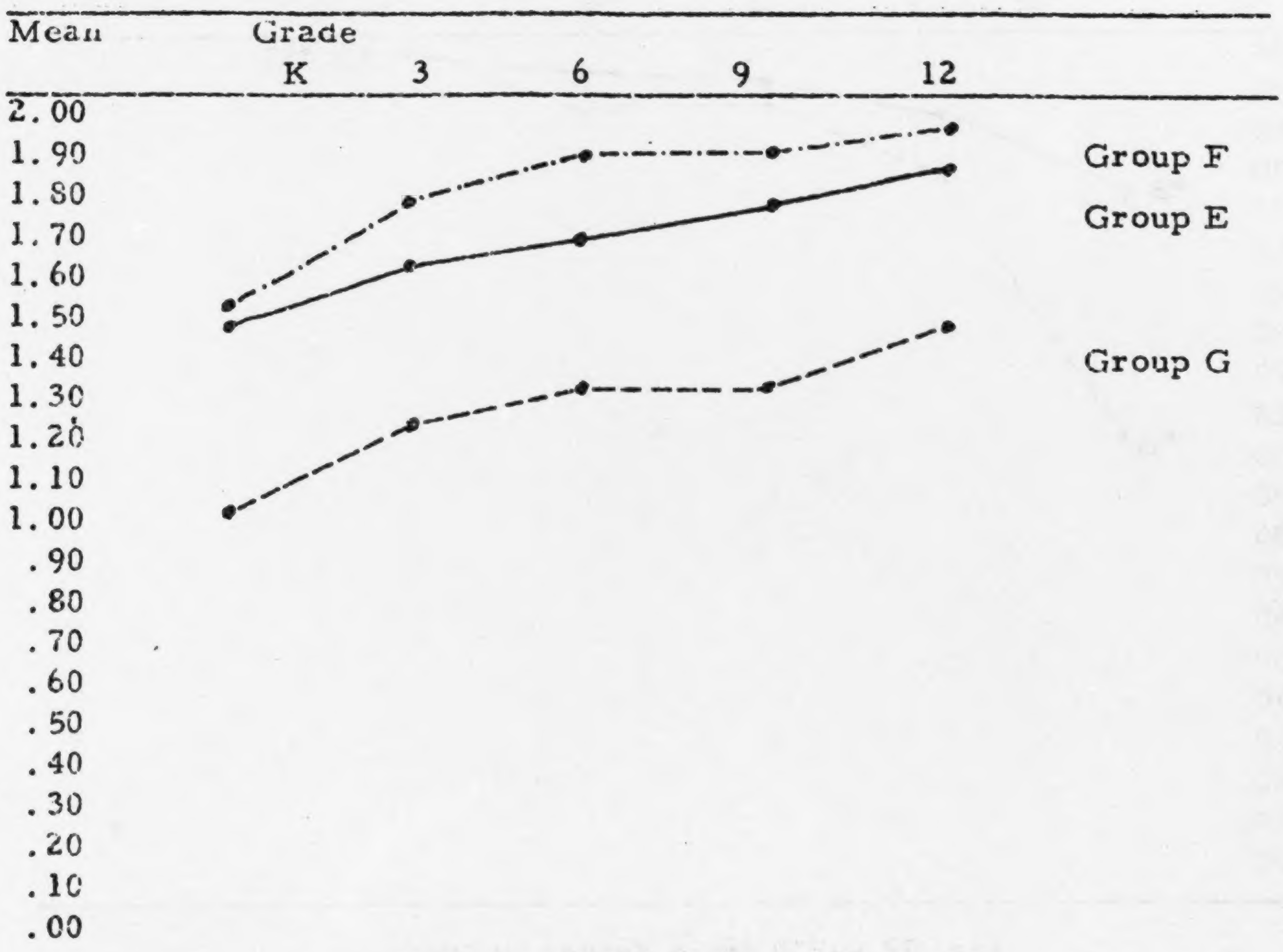
One-third of the subjects administered the Visual Generalization Displays were asked to discuss how the CDS reproductions "look alike" for 10 items. Transcriptions of these responses were analyzed by three judges who tallied all references to visual attributes. The judges, working independently, tallied responses as they referred to each of the specified attributes. For example, "They are mostly green trees" was tallied as one reference to color and one reference to subject matter. Table IX presents inter-judge reliabilities for these analyses. The reliabilities



Group A: One to three critical attributes.
Items #5, 10, 11, 16, 18, 19, 20.
Group B: Four to six critical attributes.
Items #2, 5, 17.
Group C: Seven to nine critical attributes.
Items #6, 7, 9, 12, 13, 14.
Group D: Ten to twelve critical attributes.
Items #1, 3, 4, 8.

Fig. 10.--Visual Generalization Item Means Grouped by the Number of Critical Attributes in Each Display.

were calculated from an analysis of variance and showed a .95 inter-judge agreement. Each of the judges had considerable experience with the categories, based upon project and curricular experience with similar constructs used by Elliot Eisner. This familiarity may (according to Magnusson (51)) cause unduly high inter-judge agreement. On the other hand, the responses being analyzed were quite simple;



Group E: Displays of one artist, one style.
Items #1, 3, 4, 6, 7, 8, 14, 16, 17.

Group F. Displays of several artists, one style.
Items #2, 9, 12, 15.

Group G: Displays of attributes independent of style.
Items #5, 10, 11, 16, 18, 19, 20.

Fig. 11.--Visual Generalization Item Means Grouped by the Type of Item.

few were difficult to encode (See sample responses quoted in Q4 below).

Table X presents the frequency of references by subjects to each attribute for each Visual Generalization Display. A total of 1,445 verbal references to visual attributes were noted. Subjects referred

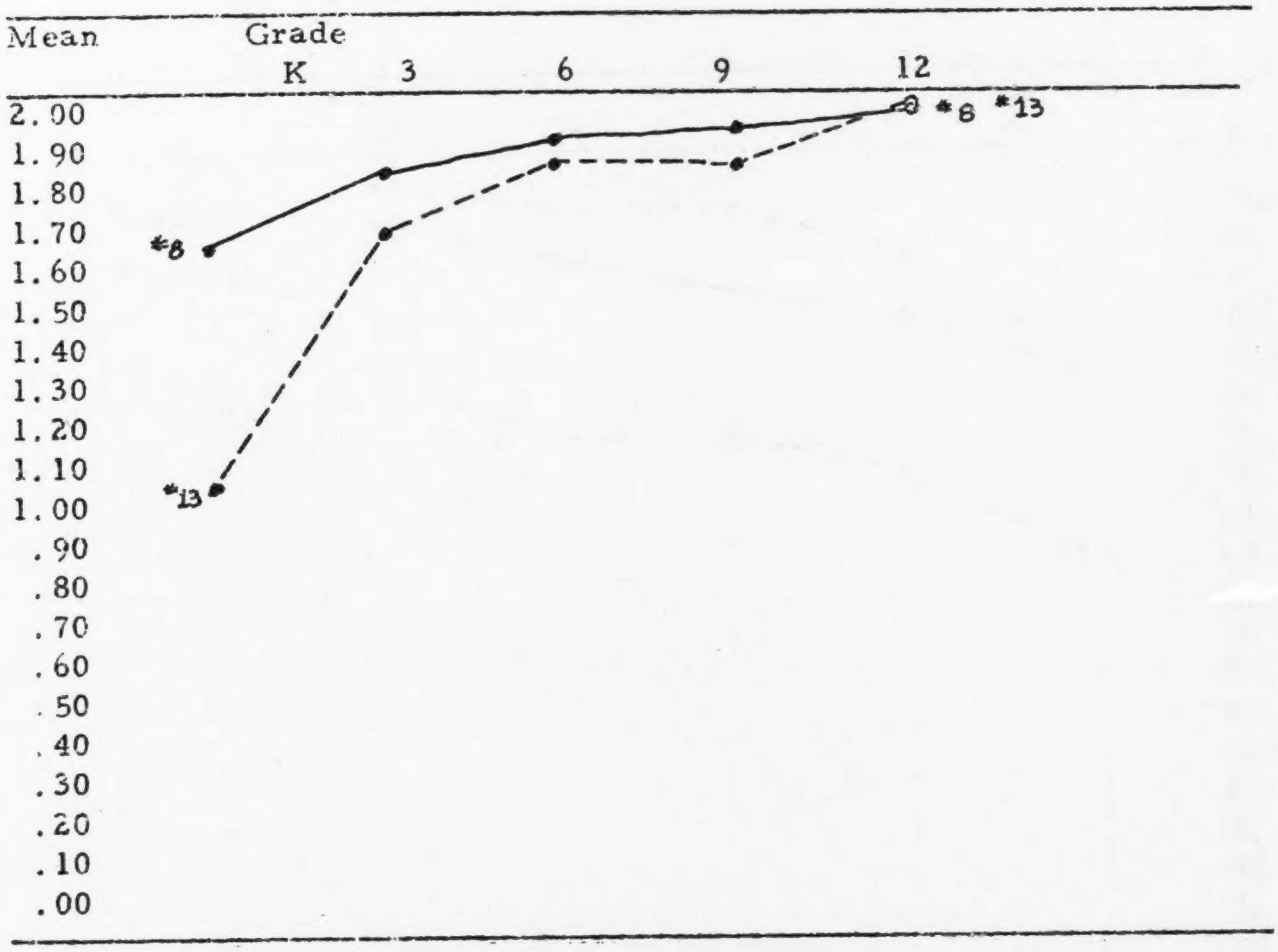


Fig. 12.--VGD Score Means by Grade--
Displays #8 and 13.

to subject matter, color, and style more often than to other attributes. These three attributes accounted for 73% of the verbal reference to attributes. Similarly Heidbreder (42) has shown that subjects react chiefly to "concrete objects" and less often to "less thing-like" objects. Subject matter, color, and general visual similarity are common reference points in reading and other classroom materials. Many pre-primers emphasize these attributes in discrimination and classification exercises. The remaining nine attributes are more specifically those which might be studied in the art classroom and are of greater importance to aesthetic judgment. The frequency of references by subjects to these attributes were: form (8.04%), material (4.47%), technique (3.64%), composition (3.64%), thematic (2.89%), expressive (2.27%), line (1.86%), symbolic (.21%), and historical (.21%).

The extent to which a subject remarks on an attribute might be expected to depend on whether the attribute is "critical" for the concept

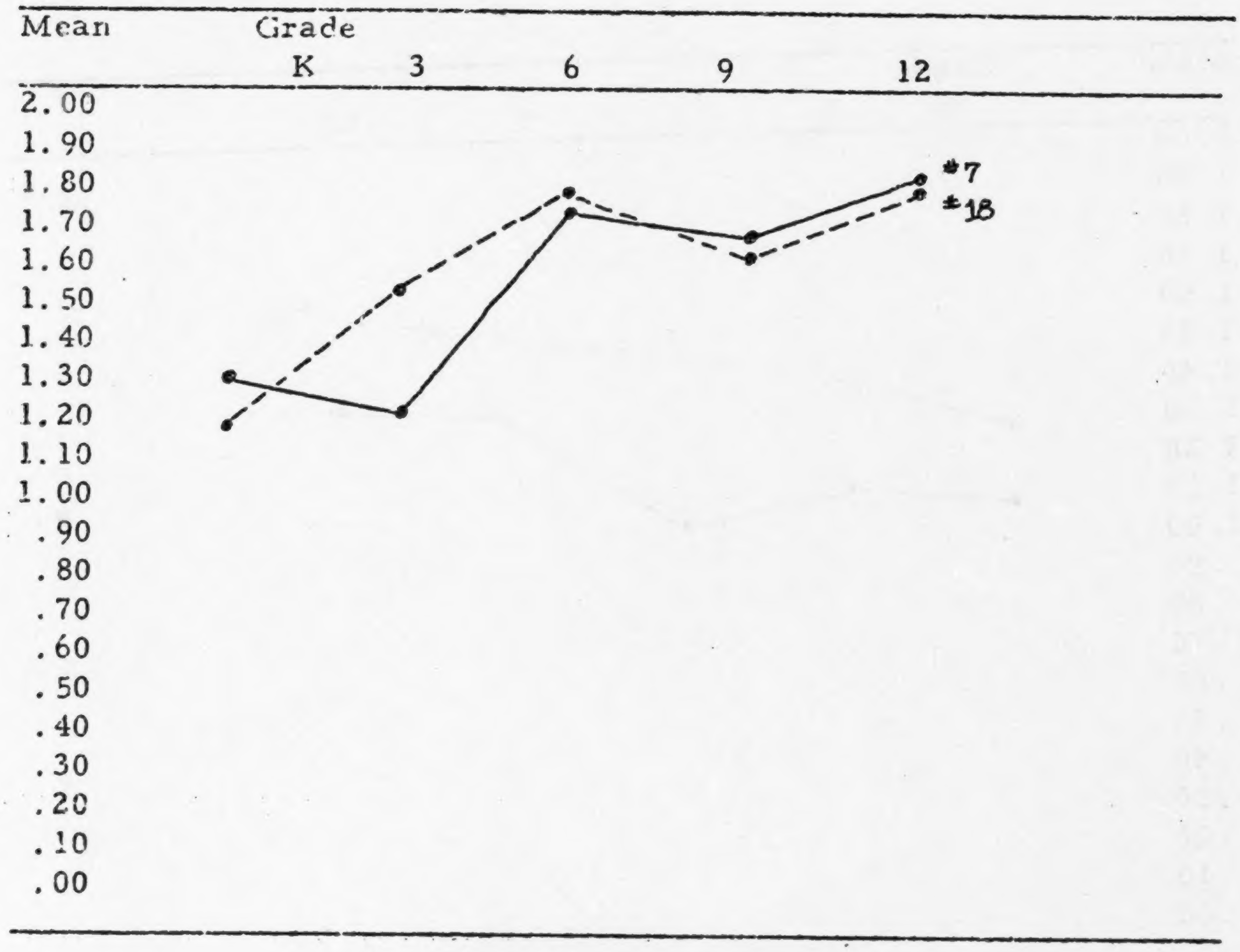


Fig. 13.—VGD Score Means by Grade—
Displays #7 and 18.

embodied in a display. However, when the frequencies of verbal responses to attributes are adjusted for the number of displays in which the attributes are critical the numbers do not change markedly. The adjusted frequencies (frequency of mention divided by the number of displays in which the attribute is critical) are: subject matter 41.8%; color 34.1%; style 13.4%; form 9%; material 6.5%; expressive 5.5%; composition 4.8%; technique 4.8%; thematic 3.5%; line 2.4%; symbolic 1%; and historical .2%. Thus the majority of the attributes which could have been used for successful classification were rarely noted.

Discussion:

The ordering of verbal references to visual attributes is approximately from the obvious to the subtle. Attention to the obvious may account for the "plateau" effects noted in the visual display

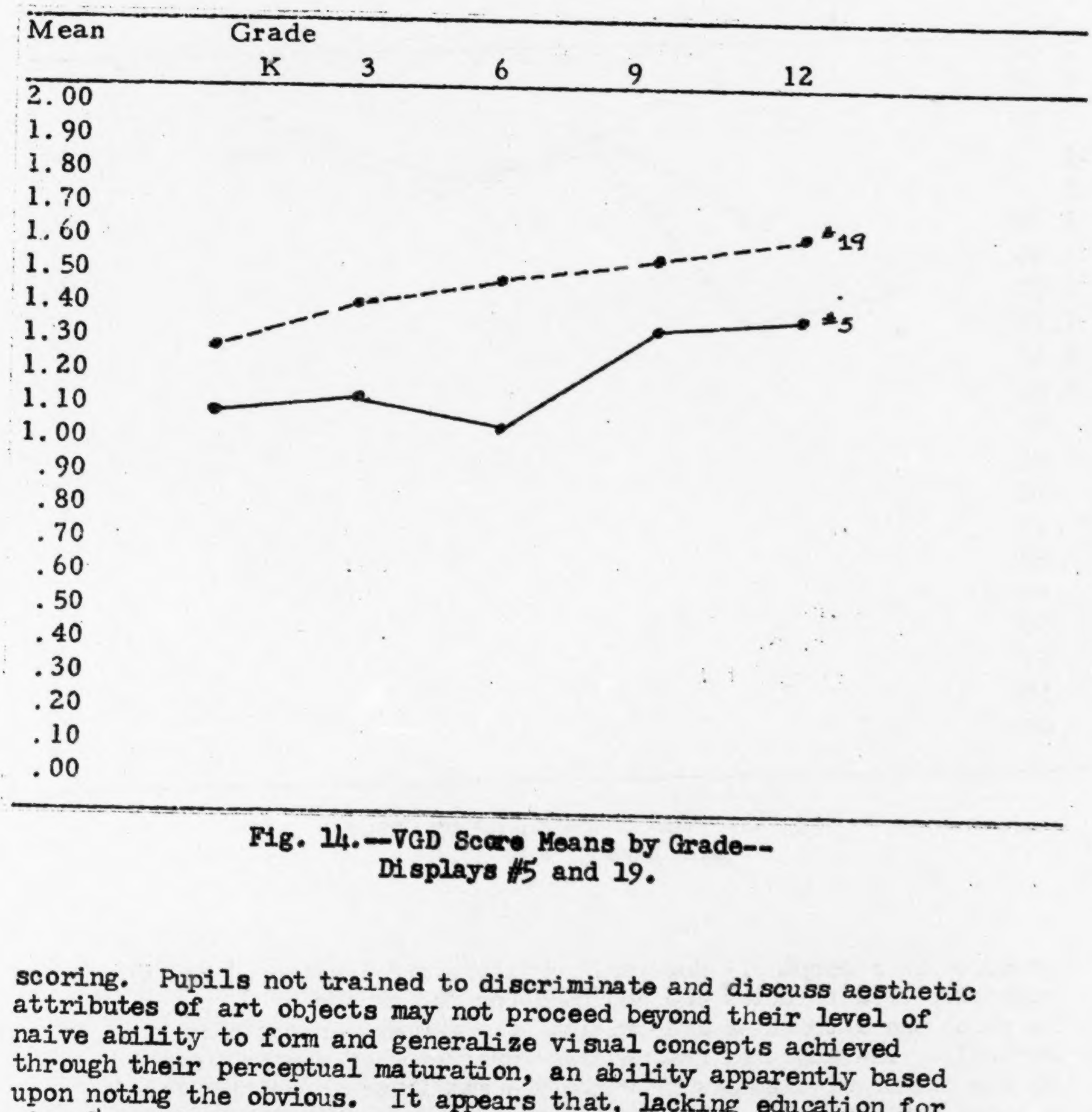


**Fig. 14.—VGD Score Means by Grade—
Displays #5 and 19.**

scoring. Pupils not trained to discriminate and discuss aesthetic attributes of art objects may not proceed beyond their level of naive ability to form and generalize visual concepts achieved through their perceptual maturation, an ability apparently based upon noting the obvious. It appears that, lacking education for visual sensibility, public school students attend predominantly to those attributes of art reproductions consistent with the public's definition of art as its "literary, sentimental and moral content" (73:19).

The number of references to attributes drawn by a Visual Generalization Display is correlated with difficulty indices. The easiest displays were all based on discrimination of a style and the style-based displays triggered the greatest number of comments. Many subjects responded with silence or questions while observing the more difficult displays. Attention to the critical attributes of color,

TABLE IX

RELIABILITY COEFFICIENTS OF THREE RATERS JUDGING THE REFERENCES TO VISUAL ATTRIBUTES IN TRANSCRIPTIONS OF TAPE-RECORDED TEST ADMINISTRATIONS

Visual Attribute Categories	Inter-Judge Reliability
1. Color	.99
2. Line	.98
3. Form	.99
4. Composition	.91
5. Material	.99
6. Technical	.91
7. Subject Matter	.99
8. Symbolic	.99
9. Thematic	.71
10. Expressive	.99
11. Historical	.95
12. Overall Style	.81
Total across categories	.95

subject matter, and "style" were sufficient to classify many of the easier displays. Verbalization of the attributes critical for classification of the other displays was difficult for most subjects. It appears the subjects lacked vocabulary to indicate those attributes which are most appropriately studied in art classrooms (see question 4). Yet, to be able to discuss art and the observed attributes of art objects is important to meaningful aesthetic responding and to art criticism.

4. What is the nature of children's verbal responses to the task of classifying observed visual similarities of selected sets of art reproductions?

TABLE X

NUMBER OF REFERENCES TO VISUAL ATTRIBUTES OF GENERALIZATION DISPLAYS DURING VERBAL ADMINISTRATION OF ITEMS (N = 93)

Visual	Displays																				Total
Attributes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Subject Matter	43	36	11	32	3	15	39	39	32	10	42	37	33	30	19	18	34	2	33	36	544
Color	21	34	10	14	24	8	24	14	15	9	15	8	13	16	40	28	18	6	16	8	341
Style	24	7	10	8	10	7	2	10	22	7	5	16	5	4	6	4	9	9	1	8	174
Form	1	0	19	7	3	17	0	4	2	0	2	1	9	7	8	2	1	30	3	1	117
Material	2	1	30	0	0	19	3	1	4	0	0	1	0	0	3	0	0	0	0	1	65
Composition	2	2	5	6	1	5	3	2	1	3	1	3	3	1	0	4	1	3	6	1	53
Technique	0	3	8	1	2	6	3	3	4	0	1	2	3	3	9	1	2	1	0	1	53
Thematic	1	0	0	2	0	1	0	1	1	0	2	22	0	0	0	5	3	0	3	1	42
Expressive	2	0	0	0	1	1	1	7	1	1	2	2	2	2	0	3	2	1	3	2	33
Line	0	4	2	4	1	1	0	0	0	0	2	1	1	4	1	1	2	0	3	0	27
Symbolic	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	3
Historical	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3
Total	96	87	95	75	46	80	75	81	83	30	72	96	69	67	86	66	72	52	68	59	

Underlining designates 'critical' attributes for each display.

Before discussing the content of verbalized display administrations an illustrative transcription from each grade will be given. The first ten items are discussed in each:

Kindergarten, Female; 6 years, 6 months:

Item 1: "...Because they are all men."
Item 2: "Because they are all funny sorta colors."
Item 3: "Sorta like shapes and stuff."
Item 4: "Some of them have holes in them and...houses, buildings."
Item 5: "Colors...."
Item 6: "Shapes--sorta flat shapes."
Item 7: "The colors in them, all sorts of colors like green and blue and white."
Item 8: "...People."
Item 9: "'Cause they are all old."
Item 10: "The colors...."

Third Grade, Male; 8 years, 9 months:

Item 1: "They are all people--they are all ladies?"
Item 2: "They are all out in the country--and they are all colors."
Item 3: "They are all different shapes."
Item 4: "They all have buildings, I don't see anything else."
Item 5: "...Um...I don't know."
Item 6: "There's all different shapes--that one looks like that one a little bit...that's all."
Item 7: "They all have trees in them."
Item 8: "They all have people in them--most of them are grownups."
Item 9: "They all have mountains in them."
Item 10: "...Are these apples?"
"Oh...they're all...everything's out in the country."

Sixth Grade, Female; 12 years, 7 months:

Item 1: "They are all people...they all have--no...they all have a coat on...They all have dark colors."
Item 2: "They all have bright colors...they all have houses in them...they have greens and oranges in them...and I guess that's all."
Item 3: "Um...let's see...None of them really look like anything."
Item 4: "Let's see...all have pictures of buildings...They all have people in them--in the background. They all have red in them...they don't look like you could step outside and see them...and that's about all."
Item 5: "They are all in dark colors...Everything looks the same to me."
Item 6: "They all have holes in them...They all have a design that doesn't look like anything."

Item 7: "They are all in bright colors and they all have pictures of trees...greens, Um...they all have reds in them...and hills...that's all."

Item 8: "They are all pictures of people...they have dark colors in them. And they are all in a corner...Oh, no, I changed my mind...Everything looks the same."

Item 9: "They are all Japanese or Chinese pictures, I can't tell the difference...and...they all have hills in them and trees. They have water in them...and dark colors...they all have a little house kind of thing in them"

Item 10: "It's a tough one...Um...I just can't find anything."

Ninth Grade, Male; 14 years, 11 months:

Item 1: "Well, they all have pictures of people and they are all dark and in one part of the picture they are all dark and ...its an older style, the people aren't now."

Item 2: "They are all pictures of cities and they are sorta like in a distance it looks like...pictures...I wouldn't know what style it is, but there's a fairly wide variety of colors--reds and blues and greens."

Item 3: "They are all sculptures...Um...they are not normal shapes, they're abstract...they're all rounded figures."

Item 4: "They are all drawings. They're not pictures of anything... they're something it looks like they were all set up or something and the artist had to draw it...and, uh...it looks like in the future, sort of...."

Item 5: "They are all pictures, it looks like--not all of them, but some of them look like they were made--this one looks like it was made out of tiles sort of, but...uh...Well, a lot of them, these don't have too much in common here. The top row are all the same, sort of, and the bottom row are all the same but between the top and the bottom there isn't very much in common."

Item 6: "They are all sculptures, looks like they were made out of wood or--no, wood and stone...and they are rounded figures...and...some are sanded very smooth and the other ones are rough."

Item 7: "They are all country pictures--and...alot of trees and not a whole lot of houses...."

Item 8: "They are all pictures of people and their faces are all rounded and everything's rounded...they're all portraits--somebody sitting or standing. And they all got their hands crossed or on their laps."

Item 9: "They are all over from Chinese, that's pretty obvious... They've got the trees that are hanging over...The Japanese or Chinese writing--that's about it...a lot of them have the sea, you know, surrounding the area."

Item 10: "Some of them are and some of them aren't, they're all mostly different...."

Twelfth Grade, Male; 18 years, 4 months:

Item 1: "O.K., there's, uh...each one has people in it, and its fairly old drawings, and they are fairly dark and drab."
Item 2: "These are fairly bright, quite a few different colors in them...and they are mostly of towns."
Item 3: "These are more abstract...and they are carved out of stone or something...they are mostly curved...most of them are round sculptures."
Item 4: "...Oh, boy,...there's a building, looks like...they all have arches...Realistic, some of them have fairly abstract objects in them."
Item 5: "There isn't too much...Well, they're brown...light brown and dark brown."
Item 6: "Uh...well, they're sculptures again...the lines are round...made out of different materials. I'd say they were abstract for the most part."
Item 7: "These are landscapes...the colors are fairly bright...."
Item 8: "These are all of people...and they look sort of not really sad, but just...uh...really bored with everything ...lot of greys and dark browns."
Item 9: "These are...they have foreign markings on them so they must be from Japan or China...the only colors are in brown...and they also have landscapes."
Item 10: "There's not too much in common here...Most of these are horizontal."

These transcripts are representative of the subjects' responses at each grade. A number of observations based upon the transcriptions are possible.

Discussion:

1. Responses increased in complexity in successive grades, i.e., older subjects attempted more description and identification of similarities.

2. Most references to attributes consisted simply of naming. The "surface" quality or lack of reference to attributes beyond naming previously noted in research by Kuhlman (13) was characteristic of the responses of all subjects. None of the analytic possibilities of discussing an attribute in depth or attending to inter-attribute relationships occurred in subjects' responses.

3. Primary grade subjects typically referred to one or two attributes per item. The prod, "Do you see any other ways they all look alike?", failed to increase the number of references to attributes

for these subjects. Subjects in the sixth, ninth, and twelfth grades typically identified three to five attributes per display. The prod question elicited an additional response for nearly 50% of the upper grade subjects.

A "fluency" score was calculated for each subject whose display administrations were tape-recorded for ten Visual Generalization Displays. The mean fluency score per grade shifted as the discussion above would indicate. Kindergarten and third grade mean fluency scores were 1.6 and 1.7 per display. Sixth, ninth, and twelfth grade subjects noted, on the average, two attributes more than primary subjects per display. Correcting the fluency scores (by removing references to attributes other than those critical to classification of the reproductions) reduced the scores. The corrected mean fluency scores per grade were: kindergarten, 1.0; third, 0.8; sixth, 1.9; ninth, 2.1; twelfth, 2.0. Primary grade subjects noted approximately one critical attribute. Intermediate and secondary subjects noted almost four attributes per display of which two were critical to correct classification.

4. Many responses in all grades were unsure, tentative, or questioning. A rising tonal inflection at the end of phrases and sentences characterized many responses.

One finding which emerged clearly from the transcriptions was the inability of subjects to talk clearly or decisively about visual attributes of the displays. Hesitations, incomplete statements, attempts to revise statements, and stated inability to express their thinking permeates the transcripts. As the administration of the displays ended, subjects frequently expressed their felt difficulty in verbalizing description, classification, or reactions to the art reproductions. Whatever art education experiences the subjects had in the past failed to prepare them to discuss with confidence the attributes they observed in art reproductions. Difficult items often failed to trigger any verbal response.

5. The displays based upon generalization of attributes independent of style and exhibiting the least number of critical attributes elicited silence from 66% of the kindergarten and third grade subjects and from 40% of the sixth, ninth, and twelfth grade subjects. In addition, many comments were questions or negative, such as, "I don't know."

Most of the subjects who gave negative responses considered the directive question answered. There are no examples of a question or negative response followed by a pause and the identification of an attribute similarity. Many ninth and twelfth grade subjects, however, identified critical similarities, then mentioned the absence of additional similarities.

6. Out of 1,445 tape-recorded comments analyzed for content, only forty words were identified which can be qualified as specifically "art" vocabulary and all are at a popular level, e.g., "landscape," "portrait," "painting," "design," etc. The paucity of art vocabulary used (2.8% of total comments) and frequency of incorrect usage of this vocabulary (10.2%) raise questions about the role of subjects' verbal references to observed attributes in visual learning. In every grade some subjects responded to CDS displays with silence or negative comments ("I don't know.") yet generalized to the correct reproduction on GSS.

Few subjects were able to express their visual observations in an appropriate vocabulary. This result parallels findings by Carpenter (15) and Mirels and Efland (55). With college subjects the latter investigators found that subjects could group non-representational paintings but "frequently found it difficult to articulate the basis of their groupings" (55:19).

5. Are the abilities to form and generalize visual concepts a function of grade level, age, SES, IQ or sex of the subjects?

Grade level. Chi-square tests of the grade level dependence of relative frequencies in the scoring categories for each item are reported in Table XI. The tests indicate a significant grade level dependence in seventy percent of the items. However, evidence presented previously shows that the kindergarten to third grade gain accounts for this effect on most items. The only other sizable gain was between the ninth and twelfth grades for the difficult items. This effect appeared for both types of displays.

Age, SES, IQ, and sex. Tests of the independence of performance on each visual concept formation or generalization item and age, SES, IQ, and sex of the subjects were computed. These tests failed to yield significant differences beyond random expectations. Age comparisons for these tests were based on a median split in each grade. Of ten within-grade and two total-subject comparisons, only age in kindergarten on the VCF (F=5.95; df=1,9) was significant. While this may be a chance occurrence, it is consistent with the large gain seen between kindergarten and third grade. SES comparisons, based on five occupational categories established by Reiss (61), failed to show significant differences. IQ comparisons were based on a median split in the sixth, ninth, and twelfth grades. None of these group comparisons showed significant differences! Sex comparisons were carried out at each grade and, of ten within-grade and two total-subject comparisons, only sex in grade twelve on the VCF (F=5.85; df=1,15) was significant. Again, this may be a chance occurrence.

Discussion:

TABLE XI

TESTS OF THE INDEPENDENCE OF SCORE AND GRADE-LEVEL FOR THE DISPLAYS

The Visual Concept Formation Displays			The Visual Generalization Displays		
Display	χ^2 (df=8)	Probability of χ^2 as large or larger	Display	χ^2 (df=8)	Probability of χ^2 as large or larger
1	17.3	.03	1	15.1	.06
2	28.9	$<.01$	2	7.0	.54
3	33.6	.01	3	7.9	.45
4	38.9	.01	4	33.0	$<.01$
5	17.4	.03	5	31.8	.01
6	15.4	.05	6	37.7	.01
7	25.9	$<.01$	7	41.8	.01
8	16.6	.03	8	17.8	.02
9	43.8	$<.01$	9	20.2	.01
10	30.9	$<.01$	10	44.0	$<.01$
11	5.8	.67	11	18.3	.02
12	14.0	.08	12	40.1	$<.01$
13	16.4	.04	13	78.4	.01
14	33.0	$<.01$	14	27.0	.01
15	25.7	$<.01$	15	15.0	.06
16	10.3	.25	16	21.9	.01
17	7.3	.51	17	40.4	$<.01$
18	13.0	.11	18	45.4	$<.01$
19	19.0	.02	19	10.7	.22
20	10.6	.22	20	13.1	.11

Studies of art-related knowledge or abilities have shown performance differences related to one or more of these subject characteristics (24, 25, 41, 56). The absence of a relationship between VGD and VCF scores and age, SES, IQ, and sex in the findings of this investigation may be due to the small size of the sample and inconsistency of subjects' performance. This inconsistency of performance was reflected in the obtained reliabilities (see the discussion of instrument characteristics below). Alternatively, the scores may be independent of the characteristics noted. The tests present a set of basically visual tasks that may be relatively unrelated to the cultural background of children in public schools. Lacking instructional background, subject performance was not sufficiently varied in the categories established to yield significant differences. The effects of differences in learning and maturation on testing error are greatest if subjects lack a uniform background in the abilities tested (39). In typical public school art curricula there are few attempts to develop the abilities tested by either instrument used in this investigation.

RELIABILITY OF THE VISUAL DISPLAY INSTRUMENTS

Reliability. Within-grade reliabilities of the Visual Concept Formation and Visual Generalization Display subject performance were determined through item analysis. Indicators of total test score reliability for subjects tested at each grade are reported in Table XII. The obtained Cronbach Alpha and standard error of measurement at each grade indicated that the VCF succeeded moderately as an indicator of visual concept formation ability. The VGD did not achieve reliable measurement of individual test performance as indicated by its lack of within-grade reliability. The reliabilities reported depend statistically upon item intercorrelation and test length. These instrument characteristics are discussed below.

Item-intercorrelation. The median product-moment intercorrelations of VCF items at each grade were: kindergarten .048; third .039; sixth .046; ninth .064; and twelfth .138. The median intercorrelations of VGD items at each grade were: kindergarten -.004; third -.013; sixth .012; ninth -.01; and twelfth .006. Low item intercorrelations suggest that the subjects guessed randomly, but the greater than chance scores and successful task verbalization contradict this supposition. One possible explanation of the heterogeneity of performance is that items call for different specific abilities. Factors previously identified and discussed support this explanation. Effects of the visual complexity of the displays, the number of critical attributes exhibited, the type of overall content to be classified and generalized, and the subjects' lack of instructional background for these tasks argue for

TABLE XII

RELIABILITIES OF THE VISUAL DISPLAY INSTRUMENTS

THE VISUAL CONCEPT FORMATION DISPLAYS

Grade	Number of Subjects	Mean	Standard Deviation	Cronbach Alpha	Standard Error of Measurement
K	10	11.50	4.03	.60	2.54
3	24	22.96	4.03	.57	2.66
6	20	22.00	3.77	.42	2.87
9	19	20.32	4.71	.65	2.78
12	16	23.94	5.86	.73	3.05

THE VISUAL GENERALIZATION DISPLAYS

Grade	Number of Subjects	Mean	Standard Deviation	Cronbach Alpha	Standard Error of Measurement
K	55	26.76	2.67	-.38*	2.67
3	52	30.25	2.50	-.30*	2.50
6	55	31.84	2.99	.30	2.45
9	58	32.33	2.45	-.17*	2.45
12	55	34.11	2.31	-.08*	2.31

* Implies reliability near zero. Standard error of measurement calculated assuming r=.00.

relatively independent performance on each item.

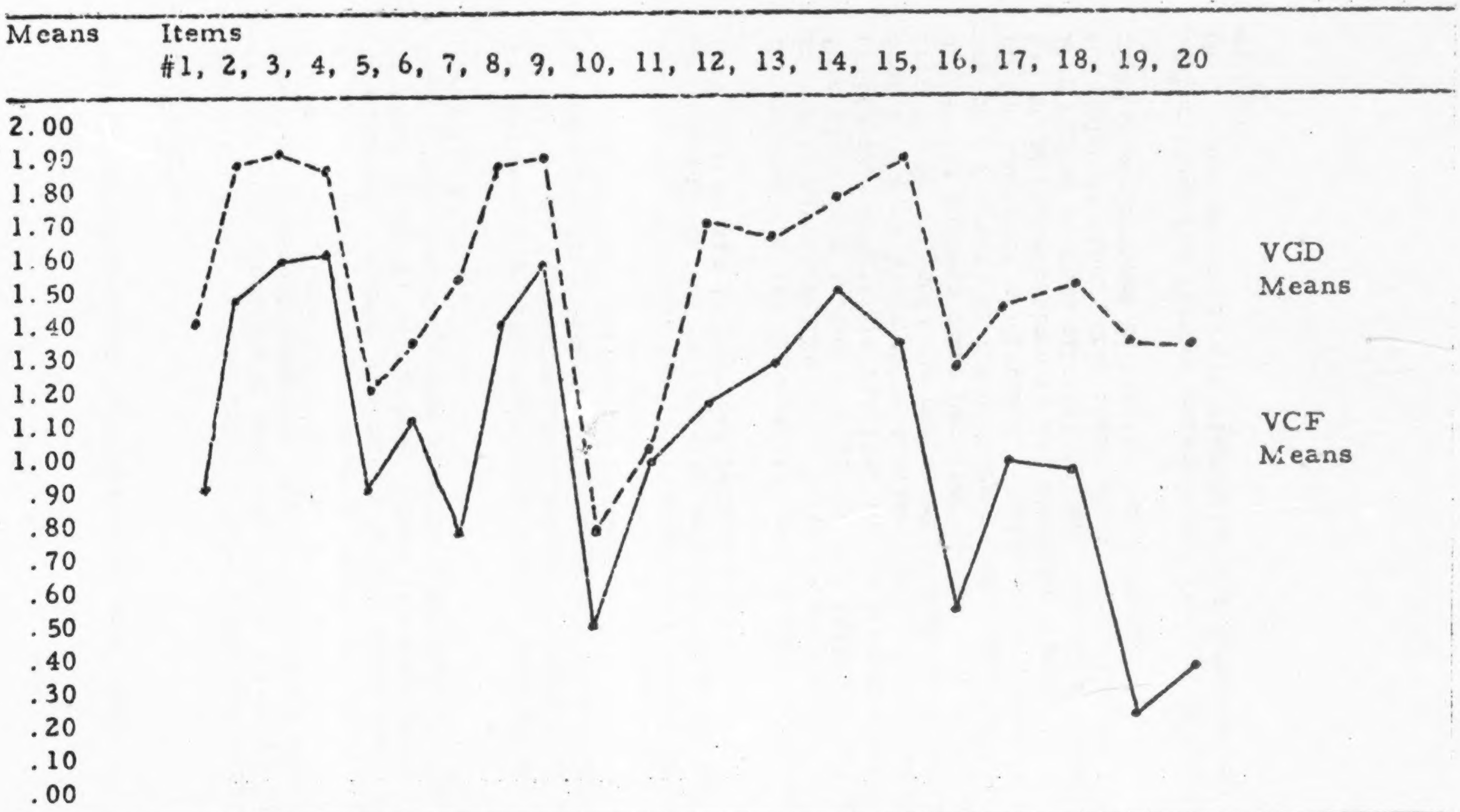
Discussion.

The reliability of the Visual Concept Formation Displays was moderately high, indicating some consistency in subjects' performance. The Visual Concept Formation Display instrument would have to be increased in length 3.5 times (to 70 displays) to yield a reliability of .90. More profitable, however, would be item revisions designed to eliminate "paired" reproductions and those items with only one to three critical attributes. These two revisions, plus increased test length, could achieve a reliable measure of visual concept formation ability.

The evidence indicates that there was no consistency of performance on the Visual Generalization Displays. Scores from pilot testing of the VGD with college and secondary school subjects who had art training in their background yielded reliabilities of around .60. Yet with a slightly revised version, administered to subjects with little art training, the VGD yielded essentially no reliability. Lengthening the VGD or revising selected items do not seem to be promising routes to improved reliability.

Scores from the two instruments used in this investigation were significantly correlated (r=.38 for 89 subjects) in a sample drawn from all grades tested. While the two instruments yielded very different quantitative results, the pattern of item difficulties seen in Figure 15 is quite similar. This figure presents data from the 89 subjects who responded to both instruments. The difference in mean score per item (taken as a difficulty measure) may be a function of the different tasks presented by administration of the two types of displays. Making an appropriate selection from the three reproductions in GSS displays appears to be considerably less difficult than eliminating two dissimilar reproductions from a display of nine. Only items #7, 19 and 20 broke the pattern of similar performance on the two instruments.

Implications for further research and for use of the findings of this investigation in art classrooms are discussed in the following section.



VGD Mean of all Items, all Subjects=1.55.
VCF Mean of all Items, all Subjects=1.05.

Fig. 15.—Comparison of VCF and VGD Scoring on Both Instruments (Number of Subjects = 89).

RECOMMENDATIONS

CONCLUSIONS AND IMPLICATIONS OF THE INVESTIGATION

Visual phenomena are the fundamental content of visual art curricula, whether productive, critical or historical aspects of art are being studied (2, 6, 20, 48, 68, 72). In practice, however, visual phenomena are subordinated in school art programs to discursive or verbal phenomena and production-based art activities (3, 9, 11, 26, 32, 49). Educating students to attend visually to the attributes of art objects has been an expressed goal of American art education since before 1900 (17, 19), yet few models exist for basically visual experiences planned to teach or test art-relevant observation skills.

The displays designed for this investigation (and grouped into two instruments) offer such a model. The displays were administered in silence following the administration of two training items. Discussion of the training items was necessary to establish a behavior pattern to be followed throughout the test administration. Following this pattern, the subjects observed the reproductions and made classification and generalization decisions on the basis of their observation. Thus a primary conclusion of this investigation was that essentially visual instruments displaying visually complex art reproductions could be designed to measure visual attending and learning. Additionally, models were created (based on the two types of displays designed for this investigation) which may be adapted for the creation of visual teaching material.

The investigation indicated that children can discriminate and classify visual concepts based upon visual similarities of art reproductions. It was also found that children can generalize the concepts formed by selecting visually similar art reproductions displayed among distractors. However, no significant gains in concept formation and generalization were apparent over three-year spans between the grades tested and the subjects failed to show much qualitative improvement across grades in their verbal responses. These findings are consistent with the present lack of visual sensibility education in public school art curricula. This conclusion supports the contentions noted earlier that the schools have failed to educate the visual sensibility of pupils (3, 6, 11, 24, 47, 69) and fail to teach the perceptual skills (23) and vocabulary (4, 10, 22, 26, 55) which pupils need to maintain interest and understanding in the visual arts.

Instructional materials based on the displays created for this investigation could be adapted to teach visual sensibility skills. Subject performance demonstrated that some of the abilities instrumental in visual concept formation and generalization are already possessed by school-age children above kindergarten. Students in art education classes could be educated to attend more knowledgeably to visual attributes of art objects through directed observation of displays designed for this purpose. In directed experiences, during which groups of students were observing multiple copies of one display, the students could be asked to identify and discuss attribute similarities and differences. The appropriate vocabulary needed could be taught as an integral part of these experiences in directed observation. This investigation did not attempt any teaching. It clearly demonstrated, however, the need for appropriate instruction if visual sensibility skills are desired as an outcome of art education.

RECOMMENDATIONS

The investigation identified a research area critically important for visual education in art curricula. Further research, testing the formation and generalization of visual concepts from observation of art reproductions, is recommended to provide effective guidance for increased use of conceptual content in art education curricula. Research on the identification, definition, and classification of additional visual concepts not dealt with in this investigation is required by the field.

A multi-stage continuation of this investigation is recommended. The instruments designed for this investigation have provided a model for similar testing programs. However, neither instrument yielded the reliability or statistical validation that would warrant its use without modification. Therefore, the following stages are recommended for continuation of this investigation:

1. The lack of consistent performance on the VGD may have been partially caused by the necessity for memorization of images (40). The redesign of this instrument, with visual concept displays and selection options on one page should be tested.

2. Revisions of test display contents as required:

   a. Elimination of VCF reproductions which can be paired due to attribute similarities.

   b. Elimination of VGD and VCF displays based on only one to three critical attributes or:

3. Creation of three test versions for each task--three equal-length sets of displays with (1) displays exhibiting one style by one artist, (2) displays exhibiting one style by several

artists, and (3) displays exhibiting specific visual attributes independent of style. Each booklet should be introduced with training items appropriate for the types of displays contained within it.

4. Creation of additional generalization displays of various levels of difficulty.

5. Pilot testing of the above instruments in populations with successively decreasing knowledge of art. The purpose of this pilot testing would be to isolate factors responsible for the differences in reliability found when the VGD was administered to college, secondary and elementary students with different art education backgrounds. The pilot work should test the following groups in the order indicated:

   a. Graduate art and art education majors.

   b. non-art graduate majors.

   c. art, art education and non-art undergraduates.

   d. art and non-art secondary school students.

   e. junior-high school students.

   f. elementary school students.

6. Assessment of test characteristics and subject performance at each level to identify significant changes in performance. This assessment should guide the development and grouping of items appropriate to the various grades to be tested.

In addition to test construction and refinement, other research has been suggested as a result of this investigation. Unexplained complexities in subject performance were observed during the data gathering. Eye movement on the displays appeared to fall into patterns. Many subjects appeared to use one reproduction as a reference point, shifting their attention to each reproduction in turn, with glances back to the first. Others scanned the page without appearing to focus on any single reproduction, and still others studied each reproduction singly without returning their attention to previously observed reproductions. Do these different patterns of attention correlate with test performance?

Subjects were also observed to impose a temporal pattern on their encounters with the displays. The time each subject spent observing each display appeared to vary little per subject. Yet there were large differences between subjects in the time taken to inspect the displays. In other words, subjects set a temporal pattern for themselves which was relatively unaffected by the content or difficulty of the displays and these patterns differed between subjects. Is there a significant correlation between the pacing of subjects and their test performance?

Use of the visual test instruments was not accompanied by the use of additional tests. Is performance on instruments measuring the formation and generalization of visual concepts correlated with perceptual skills, reasoning ability, creativity, typical achievement abilities, or other quantifiable student characteristics? Is the independence of visual sensibility tasks and subjects' IQ found in this investigation replicable? Are there students who are more visual-dependent than verbal-dependent as speculated by some educational theorists (5, 12, 18, 36, 58)?

This investigation has demonstrated that though students can form and generalize visual concepts from their observation of art reproductions, the abilities investigated do not develop dramatically during the thirteen years of public education. This lack of development was assumed to be caused principally by the lack of visual sensibility education in current public school art activities. Given the instrument development steps outlined above, a test of this assumption could be made. A pre-test, post-test research design with intervening placebo and visual sensibility education treatments should be conducted to determine the influence of educating the abilities investigated. At present, it appears the lack of attention to visual sensibility education in current art education curricula is a causitive factor in the failure of public school art activities to teach an appropriate vocabulary of criticism, focus students' attention onto critical attributes of art works and to teach these skills in increasingly difficult and sophisticated forms over the elementary and secondary grades.

In this and the previous section, a variety of findings and implications were discussed relative to this investigation. Proposals for visual teaching materials based on the research displays and for further research into the abilities investigated were outlined to help answer a variety of questions raised by the findings. These questions were raised partially by the inconclusive nature of responses to the instruments and by subject attributes noted but not measured during the investigation. Additionally, the atypical finding of lack of correlation between visual test performance and subjects' age, SES, IQ, and sex were cited as foundations for further research.

This investigation has demonstrated that public school students can form and generalize visual concepts from visually complex art reproductions. It has also identified complexities in the performance of these tasks which the investigation failed to probe. Additional research into the role of vision in learning will be essential for the effective design and implementation of newer art curricula which are based upon the active, deliberate education of vision in the visual arts.

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APPENDICES

APPENDIX I

THE VISUAL GENERALIZATION TEST

The Visual Generalization Test is composed of two training items and twenty test items. Each item consists of two pages. The first page is a Concept Display Sheet of six related art reproductions. The second page is a Generalization Selection Sheet of three reproductions.

Art reproductions, of a manageable size and quality appropriate to the purposes of this test, were chosen as the most realistic, visually complex stimuli for this investigation in the field of art education.

Test items were constructed entirely of color illustrations selected from the Petite Encyclopedie De L'Art published by the Tudor Publishing Company of New York. Each illustration is at least 3½" X 4½" and mounted in sets on 11" X 14" sheets of stiff paper. The twenty-two sample and test items utilize 198 different art reproductions of diverse visual content.

The entire contents of The Visual Generalization Test are listed in this appendix.

Item 0: Lautrec: Circus Drawings: Scoring
CDS: 1. "Performing Horse and Monkey"
2. "Circus Rider Acknowledging Applause"
3. "Acrobats In the Ring"
4. "Jockey"
5. "Acrobat Jumping Through Hoop"
6. "Rehearsal"
GSS: A. Marc: "The Gazelle" 1
B. Kandinsky: "Joyous-Bright". 0
C. Lautrec: "Female Clown" 2

Item 00: Marc: Animals In Landscapes:
CDS: 1. "Horse In a Landscape"
2. "Horses With Eagle"
3. "Roe In a Forest"
4. "The Red Horses"
5. "The Blue Horses"
6. "A Sheep In a Landscape"

GSS: A. Marc: "Gazelles". 2
B. Villon: "From Where One Turns a Shoulder To Life". 0
C. Chagall: "The House That Burns" 1

Item 1: Rembrandt: Self Portraits:

APPENDIX I: continued

Item 1: continued
CDS 1. "Portrait Of the Artist" 1629
2. "Rembrandt As a Young Man"
3. "Portrait Of the Artist" 1634
4. "Rembrandt Dressed As an Officer"
5. "Portrait Of the Artist" 1665
6. "Rembrandt At the Age of 52" Scoring

GSS: A. Goya: "Portrait Of the Artist" 1815. . . . 1
B. Rembrandt: "The Painter With his Pallette" 2
C. Goya: "Don Ramon Satue". 0

Item 2: Fauvist Landscapes:
CDS: 1. Braque: "La Coitat Harbour"
2. Vlaminck: "Street In Marly"
3. Braque: "Antwerp Harbour"
4. Vlaminck: "Landscape With Red Trees"
5. Braque: "The Landing Stage At L'Estaque"
6. Vlaminck: "Banks Of the Sein At Carrièrs-Sur-Seine"

GSS: A. Utrillo: "Street In Montmarte" 1
B. Monet: "The Hotel Des Roches Noires, Trouville" 0
C. Braque: "The House Behind the Trees" . . . 2

Item 3: Arp: Biomorphic Sculptures:
CDS: 1. "Pre-Adamic Torso"
2. "Human-Lunar-Spectral"
3. "Chinese Shadow Play Figure"
4. "Owl Dream"
5. "Torso"
6. "Gargoyle"

GSS: A. Giacometti: "Head" 1927. 0
B. Arp: "Demeter" 2
C. Moore: "Two Forms" 1934. 1

Item 4: DeChirico: Surrealistic Landscapes"
CDS: 1. "Mystery and Melancholy Of a Street"
2. "Departure Of a Friend"
3. "Love Song"
4. "Anguish Of Departure"
5. "The Melancholy of an Afternoon"
6. "The Naval Barracks"

GSS: A. Braque: "Terrace At L'Estaque" 1

APPENDIX I: continued:

Item 4: continued: Scoring
B. DeChirico: "Nostalgia For the Infinite. . . . 2
C. Magritte: "Perspective: The Balcony by Manet" 0

Item 5: Brown Color Predominance:
CDS: 1. Klee: "Relief of a Vase of Flowers"
2. Miro: "Woman, Birds, Star"
3. Kandinsky: "Development in Brown"
4. Icon: "Saint George"
5. Modigliani: "The Painter Soutine"
6. Fujiwara: "Invalid Woman With Her Faithful Cock"

GSS: A. Klee: "Child on the Step" 2
B. Miro: "Woman in the Night". 1
C. Chagall: "The Yellow Rabbi" 0

Item 6: Moore: 'Reclining Figure' Sculptures:
CDS: 1. "Two Piece Reclining Figure, #2"
2. "Reclining Figure (Internal External Forms)"
3. "Two Piece Reclining Figure, #1"
4. "Reclining Figure" 1936
5. "Reclining Figure" 1939
6. "Three Piece Reclining Figure"

GSS: A. Rodin: "The Danaid" 1
B. Michelangelo: "Day" Tomb of Giuliano De Medici 0
C. Moore: "Draped Reclining Figure". . . 2

Item 7: Cezanne: Landscapes:
CDS: 1. "The House Behind the Trees (Near Jas DeBouffan)"
2. "The Sea At L'Estaque"
3. "View of Gardanne"
4. "House With Cracked Walls"
5. "Mount Marseilleveyre"
6. "Undergrowth With Rocks"

GSS: A. Cezanne: "Landscape With Rocks" 2
B. Monet: "Vétheuil-Sur-Sein". 0
C. Utrillo: "Church In Corsica". 1

Item 8: Modigliani: Portraits:
CDS: 1. "A Daughter of the People"
2. "Woman Seated"
3. "The Little Peasant"
4. "The Poet Leopold Zborowski"
5. "Little Girl in Blue"
6. "The Boy in Blue (Pink Jersey)"

APPENDIX I: continued:

Item 8: continued — Scoring

GSS:
A. Matisse: "Madame Greta Prozor" 0
B. Modigliani: "Gipsy Woman and Child". 2
C. Matisse: "Madame Matisse". 1

Item 9: Chinese 'Floating World' Landscapes:

CDS:
1. Fan K'uan: "Snowy Landscape"
2. Kuo Hsai: "Wood In Winter"
3. Hsai Kuei: "The Downpour"
4. Ni Tsan: "Landscape With Hut"
5. Ma Yüan: "Landscape With Willows:
6. Mi Fu: "Mountain In Spring"

GSS:
A. Liang K'ai: "The Poet Li T'ai-Po". 0
B. Ma Lin: "Two Birds 1
C. Mi Fu: "Landscape In Clouds" 2

Item 10: Horizontal Composition

CDS:
1. Sumiyoshi Keion: "Heiji Monogatari"
2. Cezanne: "The Cutting"
3. Buffet: "The Pont Neuf and the Square Du Vert-Galant"
4. Mu Ch'i: "Persimmons"
5. Ma Yüan: "Fisherman on a Lake in Winter"
6. Van Gogh: "Plain Near Auvers"

GSS:
A. DeChirico: "Melancholy of an Autumn Afternoon" 1
B. Miro: "Model for the Wall of the Moon" . . . 2
C. Utrillo: "Place de Centre-Montmarte" 0

Item 11: Central Vanishing Point Perspective:

CDS:
1. Van Gogh: "The Roofs, View From Van Gogh's Studio in the Shenkweg"
2. Utrillo: "The Impasse Cottin"
3. Buffet: "The Moulin de la Galette"
4. Utrillo: "The Rue Saint-Rustique, Montmarte"
5. Vlaminck: "Village Street Under Snow"
6. Vlaminck "The Thatched Cottages"

GSS:
A. Vlaminck: "The Road. 2
B. Utrillo: "The Sacre-Coeur de Montmarte Beflagged" 1
C. Vlaminck: "Cornfields" 0

APPENDIX I: continued:

Item 12: Russian Icons:
CDS: 1. "The Virgin of the Catacombs Between SS. Nicetas and Anastasia"
2. "Crucifixion"
3. "The Entombment"
4. "Virgin Orans"
5. "The Prophet Elias"
6. "The Annunciation"

Scoring
GSS: A. Miniature: "Kathak Dancing Girls". . . 0
B. Catalan: "The Annunciation". 1
C. Icon: "The Trinity". 2

Item 13: Cubist Still Lifes:
CDS: 1. Braque: "Parma Violet"
2. Gris: "The Bag of Coffee"
3. Picasso: "Still Life With Guitar"
4. Gris: "The Album"
5. Picasso: "Guitar with Fruit Dishes and Grapes"
6. Gris: "Guitar and Clarinette"

GSS: A. Matisse: "The Sideboard" 1
B. Gris: "Bottle and Fruit Dish". 2
C. Marc: "The Tiger" 0

Item 14: Nicholson: Still Lifes:
CDS: 1. "October 1955 (Plate of Pears)"
2. "September 1958 (Iseo)"
3. "May 1955 (Carved Forms and Indigo)"
4. "Girdie"
5. "May 1957 (Aegina)"
6. "November 1950 (Winter)"

GSS: A. Braque: "The Newspaper". 1
B. Nicholson: "August 1956 (Smoke Topaz)" 2
C. Klee: "Open" 0

Item 15: Staël: Expressionist Paintings:
CDS: 1. "Argigento"
2. "Bottles"
3. "Standing Nude"
4. "Football Players"
5. "Parc de Princes"
6. "The Musicians"

GSS: A. Klee: "Composition". 0
B. Staël: "Sicilian Landscape". 2
C. Klee: "Motif from Hammamet". 1

APPENDIX I: continued:

Item 16: Blue Color Predominance:
CDS: 1. Monet: "Landscape with Snow, at Dusk"
2. Chagall: "The Gates of the Cemetary"
3. Monet: "Yellow Irises, Giverny"
4. Staël: "The Sky at Honfleur"
5. Mondrian: "The Red Tree"
6. Van Gogh: "Boots"
Scoring
GSS: A. Utrillo: "The Rue Muller". 0
B. Chagall: "The Grey House". 1
C. Staël: "A Corner of the Studio; Blue Background". 2

Item 17: Van Gogh: Landscapes:
CDS: 1. "Montmarte Fête"
2. "Cornfield with Larks"
3. "Montmarte Gardens in Winter"
4. "The Restaurant De La Sirène"
5. "Wheatfield With Cypress"
6. "View of an Industrial Town"
GSS: A. Van Gogh: "The Grau At Arles: Peach Trees in Blossom". 2
B. Monet: "Cap D'Antibes" 1
C. Utrillo: "The Lapin Agile" 0

Item 18: Circular/Oval Forms:
CDS: 1. Kandinsky: "In the Black Circle"
2. Nicholson: "May 1957 (Monolith)"
3. Michelangelo: "The Pitti Madonna"
4. Braque: "Glass and Violin"
5. Chao Ta-Nien: "Pavillion Under the Willows"
6. Arp: "Head, Bird and Navels"
GSS: A. Mondrian: "Facade of a Church" 1
B. Klee: "Antique Harmonies". 0
C. Kandinsky: "Accent in Pink". 2

Item 19: Divided Horizontal Composition:
CDS: 1. Vlaminck: "Seascape"
2. Klee: "City of Lagoons"
3. Buffet: "The Place De La Concorde"
4. Van Gogh: "Boats on the Beach"
5. Vlaminck: "Village Among Cornfields"
6. Van Gogh: "Sunset Near Arles"
GSS: A. Buffet: "The Opera". 0
B. Buffet: "The Pont de Grenelle and the Statue of Liberty" 2
C. Buffet: "The Place Des Vosges" 1

APPENDIX I: continued:

Item 20: Triangular Composition:
CDS: 1. Michelangelo: "Pieta"
2. Chagall: "The Fiancee with Black Gloves"
3. Velasquez: "The Infanta Marguerita"
4. Picasso: "Standing Woman"
5. Van Gogh: "Portrait of the Artist after Cutting Off His Ear"
6. Giacometti: "Annette"

			Scoring
GSS:	A.	Michelangelo: "Pieta" (detail).	2
	B.	Michelangelo: "Dawn" (detail)	1
	C.	Picasso: "Mask of a Man".	0

APPENDIX II

THE VISUAL CONCEPT FORMATION TEST

The Visual Concept Formation Test is composed of twenty-two items which duplicate the content of the Visual Generalization Test. This test presents all nine illustrations of a Visual Generalization Test Item on one page.

The entire contents of the Visual Concept Formation Test are listed in this appendix:

Item 0: Lautrec: Circus Drawings:
- A. Lautrec: "Circus Riders Acknowledging Applause"
- B. Lautrec: "Performing Horse and Monkey"
- C. Marc: "The Gazelle"
- D. Lautrec: "Rehearsal"
- E. Lautrec: "Acrobat Jumping Through Hoop"
- F. Lautrec: "Jockey"
- G. Kandinsky: "Joyous-Bright"
- H. Lautrec: "Acrobats in the Ring"
- I. Lautrec: "Female Clown"

Item 00: Marc: Animals In Landscapes:
- A. Marc: "Gazelles"
- B. Marc: "Roe in the Forest"
- C. Marc: "The Red Horses"
- D. Marc: "Horse in a Landscape"
- E. Villon: "From Where One Turns a Shoulder To Life"
- F. Marc: "The Blue Horses"
- G. Marc: "A Sheep In a Landscape"
- H. Marc: "Horses With Eagle"
- I. Chagall: "The House That Burns"

Item 1: Rembrandt: Self Portraits:
- A. Goya: "Portrait of the Artist" 1815
- B. Rembrandt: "Portrait of the Artist" 1629
- C. Rembrandt: "Rembrandt Dressed as an Officer"
- D. Rembrandt: "Portrait of the Artist" 1634
- E. Rembrandt: "Portrait of the Artist" 1659
- F. Goya: "Don Ramon Satue"
- G. Rembrandt: "Rembrandt as a Young Man"
- H. Rembrandt: "The Painter With His Palette"
- I. Rembrandt: "Portrait of the Artist" 1665

APPENDIX II: continued:

Item 2: Fauvist Landscapes:
- A. Vlaminck: "Landscape With Red Trees"
- B. Braque: "The House Behind the Trees"
- C. Braque: "La Ciotat Harbour"
- D. Utrillo: "Street in Montmarte"
- E. Braque: "The Landing Stage at L'Estaque"
- F. Vlaminck: "Street in Marly"
- G. Braque: "Antwerp Harbour"
- H. Vlaminck: "Banks of the Siene at Carrières-Sur-Seine"
- I. Monet: "The Hotel Des Roches Noires, Trouville"

Item 3: Arp: Biomorphic Sculptures:
- A. Arp: "Chinese Shadow Play Figure"
- B. Arp: "Torso" 1931
- C. Arp: "Owl Dream"
- D. Arp: "Pre-Adamic Torso"
- E. Arp: "Demeter"
- F. Giacometti: "Head" 1927
- G. Arp: "Human, Lunar, Spectral"
- H. Moore: "Two Forms" 1934
- I. Arp: "Gargoyle"

Item 4: DeChirico: Surrealistic Landscapes:
- A. DeChirico: "The Naval Barracks"
- B. Magritte: "Perspective" The Balcony by Manet"
- C. DeChirico: "Nostalgia for the Infinite"
- D. DeChirico: "The Melancholy of an Afternoon"
- E. DeChirico: "Departure of a Friend"
- F. DeChirico: "Anguish of Departure"
- G. Braque: "Terrace at L'Estaque"
- H. DeChirico: "Mystery and Melancholy of a Street"
- I. DeChirico: "Love Song"

Item 5: Brown Color Predominance:
- A. Miro: "Woman, Birds, Star"
- B. Kandinsky: "Development in Brown"
- C. Klee: "Relief of a Vase of Flowers"
- D. Chagall: "The Yellow Rabbi"
- E. Klee: "Child on the Step"
- F. Miro: "Women in the Night"
- G. Modigliani: "The Painter Soutine"
- H. Fujiwara Mitsunaga: "Invalid Woman with her Faithful Cock"
- I. Icon: "Saint George"

Item 6: Moore: 'Reclining Figures' Sculptures:
- A. Moore: "Draped Reclining Figure"
- B. Moore: "Three Piece Reclining Figure"

APPENDIX II: continued:

Item 6: continued:
C. Michelangelo: "Day" Tomb of Giuliano De'Medici
D. Moore: "Two Piece Reclining Figure, #2"
E. Rodin: "The Danaid"
F. Moore: "Reclining Figure" 1939
G. Moore: "Reclining Figure" 1936
H. Moore: "Reclining Figure (Internal External Forms)"
I. Moore: "Two Piece Reclining Figure, #1"

Item 7: Cezanne: Landscapes:
A. Cezanne: "The Sea at L'Estaque"
B. Cezanne: "Mount Marseilleveyre"
C. Cezanne: "Landscape with Rocks"
D. Monet: "Vétheuil-Sur-Seine"
E. Cezanne: "Undergrowth with Rocks"
F. Cezanne: "House with Cracked Walls"
G. Cezanne: "View of Gardanne"
H. Cezanne: "The House behind the Trees (Near Jas DeBouffan)"
I. Utrillo: "Church in Corsica"

Item 8: Modigliani: Portraits:
A. Modigliani: "A Daughter of the People"
B. Matisse: "Madam Greta Prozor"
C. Modigliani: "The Little Peasant"
D. Modigliani: "The Poet Leopold Zborowski"
E. Modigliani: "Gipsy Woman and Child"
F. Matisse: "Madam Matisse"
G. Modigliani: "Little Girl in Blue"
H. Modigliani: "The Boy in Blue (Pink Jersey)"
I. Modigliani: "Woman Seated"

Item 9: Chinese 'Floating World' Landscapes:
A. Kuo Hsai: "Wood in Winter"
B. Ni Tsan: "Landscape with Hut"
C. Mi Fu: "Landscape in Clouds"
D. Ma Yüan: "Landscape with Willows"
E. Ma Lin: "Two Birds"
F. Fan K'uan: "Snowy Landscape"
G. Hsai Kuei: "The Downpour"
H. Lian K'ai: "The Poet Li T'ai-po"
I. Mi Fu: "Mountain in Spring"

Item 10: Horizontal Composition:
A. Miro: "Model for the Wall of the Moon"
B. DeChirico: "Melancholy of an Autumn Afternoon"
C. Cezanne: "The Cutting"
D. Mu Ch'i: "Persimmons"

APPENDIX II: continued:

- Item 10: continued:
  - E. Van Gogh: "Plain Near Auvers"
  - F. Sumiyoshi Keion: "Heiji Monogatari"
  - G. Utrillo: "Place du Certre, Montmarte"
  - H. Ma Yüan: "Fisherman on a Lake in Winter"
  - I. Buffet: "The Pont Neuf and the Square Du Vert-Galant"

- Item 11: Central Vanishing Point Perspective:
  - A. Utrillo: "The Sacre-Coeur De Montmarte Beflagged"
  - B. Vlaminck: "The Thatched Cottages"
  - C. Utrillo: "The Impasse Cottin"
  - D. Buffet: "The Moulin de La Galette"
  - E. Vlaminck: "Village Streets Under Snow"
  - F. Vlaminck: "Cornfields"
  - G. Vlaminck: "The Road"
  - H. Utrillo: "The Rue Saint-Rustique, Montmarte"
  - I. Van Gogh: "The Roofs, View from Van Gogh's Studio in the Shenkweg"

- Item 12: Russian Icons:
  - A. Miniature: "Kathak Dancing Girls"
  - B. Icon: "The Virgin of the Catacombs Between SS. Nicetas and Anastasia"
  - C. Icon: "Virgin Orans"
  - D. Icon: "The Trinity"
  - E. Icon: "The Crucificion"
  - F. Icon: "The Annunciation"
  - G. Icon: "The Entombment"
  - H. Icon: "The Prophet Elias"
  - I. Catalan: "The Annunciation"

- Item 13: Cubist Still Lifes:
  - A. Braque: "Parma Violet"
  - B. Gris: "Guitar and Clarinette"
  - C. Marc: "The Tiger"
  - D. Gris: "The Album"
  - E. Picasso: "Still Life with Guitar"
  - F. Matisse: "The Sideboard"
  - G. Gris: "The Bag of Coffee"
  - H. Picasso: "Guitar with Fruit Dish and Grapes"
  - I. Gris: "Bottle and Fruit Dish"

- Item 14: Nicholson: Still Lifes:
  - A. Nicholson: "Girdie"
  - B. Nicholson: "October 1955 (Plate of Pears)"
  - C. Klee: "Open"
  - D. Nicholson: "May 1955 (Carved Forms and Indigo)"

APPENDIX II: continued:

Item 14: continued:
- E. Nicholson: "September 1958 (Iseo)"
- F. Nicholson: "August 1956 (Smoke Topaz)"
- G. Nicholson: "May 1957 (Aegina)"
- H. Braque: "The Newspaper"
- I. Nicholson: "November 1950 (Winter)"

Item 15: Staël: Expressionist Paintings:
- A. Staël: "The Musicians"
- B. Staël: "Standing Nude"
- C. Staël: "Bottles"
- D. Staël: "Parc de Princes"
- E. Klee: "Composition"
- F. Staël: "Sicilian Landscape"
- G. Staël: "Football Players"
- H. Staël: "Argigento"
- I. Klee: "Motif from Hammamet"

Item 16: Blue Color Predominance:
- A. Staël: "The Sky at Honfleur"
- B. Mondrian: "The Red Tree"
- C. Monet: "Yellow Irises, Giverny"
- D. Utrillo: "The Rue Muller"
- E. Chagall: "The Grey House"
- F. Van Gogh: "Boots"
- G. Staël: "A Corner of the Studio, Blue Background"
- H. Monet: "Landscape with Snow, at Dusk"
- I. Chagall: "The Gates of the Cemetary"

Item 17: Van Gogh: Landscapes:
- A. Utrillo, "The Lapin Agile"
- B. Van Gogh: "Montmarte Gardens in Winter"
- C. Monet: "Cap D'Antibes"
- D Van Gogh: "Montmarte Fête"
- E. Van Gogh: "The Restaurant De La Sirène"
- F. Van Gogh: "Cornfield with Lark"
- G. Van Gogh: "View of an Industrial Town"
- H. Van Gogh: "Wheatfield with Cypress"
- I. Van Gogh: "The Crau at Arles: Peach Trees in Blossom"

Item 18: Circular/Oval Forms Predominate:
- A. Klee: "Antique Harmonies"
- B. Chaeo Ta-nien: "Pavillion Under the Willows"
- C. Mondrian: "Facade of a Church"
- D. Nicholson: "May 1957 (Monolith)"
- E. Braque: "Glass and Violin"
- F. Kandinsky: "Accent in Pink"

APPENDIX II: continued:

Item 18: continued:
- G. Arp: "Head, Bird and Navels"
- H. Michelangelo: "The Pitti Madonna"
- I. Kandinsky: "In the Black Circle"

Item 19: Divided Horizontal Composition:
- A. Vlaminck: "Village Among Cornfields"
- B. Klee: "City of Lagoons"
- C. Vlaminck: "Seascape"
- D. Van Gogh: "Sunset Near Arles"
- E. Buffet: "The Opera"
- F. Van Gogh: "Boats on the Beach"
- G. Buffet: "The Pont De Grenelle and the Statue of Liberty"
- H. Buffet: "The Place De La Concorde"
- I. Buffet: "The Place Des Vosges"

Item 20. Triangular Composition:
- A. Picasso: "Standing Woman:
- B. Michelangelo: "Pieta"
- C. Michelangelo: "Dawn" (detail)
- D. Velasquez: "The Infanta Marguerita"
- E. Van Gogh: "Portrait of the Artist After Cutting off his Ear"
- F. Chagall: "The Fiancee in Black Gloves"
- G. Picasso: "The Mask of a Man"
- H. Michelangelo: "Pieta" (detail)
- I. Giacometti: "Annette"

APPENDIX III

VISUAL CONCEPT FORMATION TEST: SCORING KEY

ITEM:	2 Points:	1 Point:
1.	A and F.	A or F with any other letter except F or A.
2.	D and I.	D or I with any other letter except I or D.
3.	F and H.	F or H with any other letter except H or F.
4.	B and G.	B or G with any other letter except G or B.
5.	D and F.	D or F with any other letter except F or D.
6.	C and E.	C or E with any other letter except E or C.
7.	D and I.	D or I with any other letter except I or D.
8.	B and F.	B or F with any other letter except F or B.
9.	E and H.	E or H with any other letter except H or E.
10.	B and G.	B or G with any other letter except G or B.
11.	A and F.	A or F with any other letter except F or A.
12.	A and I.	A or I with any other letter except I or A.
13.	C and F.	C or F with any other letter except F or C.
14.	C and H.	C or H with any other letter except H or C.
15.	E and I.	E or I with any other letter except I or E.
16.	D and E.	D or E with any other letter except E or D.
17.	A and C.	A or C with any other letter except C or A.
18.	A and C.	A or C with any other letter except C or A.
19.	E and I.	E or I with any other letter except I or E.
20.	C and G.	C or G with any other letter except G or C.

APPENDIX IV

VISUAL GENERALIZATION TEST PROTOCOL

For each test administration a Visual Generalization Test booklet, answer sheet, and sharpened pencil must be provided.

Introduce the test administration as follows:

"This is for a research project on perception. It will have nothing to do with this school or with your class work. We want to know how well, or how carefully, you see what you look at. For this, you will be looking at sets of art reproductions, as you'll see."

"First, fill out the top of the answer sheet...:"

Be sure subject fills in Name, Date, Birthdate, Sex, School, Grade, and Instructor blanks. If subject asks about the A, B, C,... blanks, respond: "Don't put anything into the lettered spaces, these are for us to use when we score the test."

When the subject has completed the answer sheet, direct him as follows:

"Now, open the book in front of you to the first set of pictures, Item O"...(check visually that the subject is looking at the Lautrec Circus Drawings)." "Look at all of these pictures carefully...(pause)... and tell me how they all look alike. Try to see as many ways as you can."

Respond to all subject's comments by repeating the comment, then ask: "Do you see any other ways they all look alike?" or "Anything else?"

After subject has named a minimum of two attributes, direct him as follows:

"Now, turn the page, look at these pictures carefully...(pause).... Which one of these pictures looks the most like the pictures you have just seen?"

If subject indicates "C", say, "Good, circle the letter "C" after Item O on your answer sheet"...(check visually that subject marks answer sheet correctly).

If subject does not indicate "C" say, "Let's look back to the six pictures. Remember, you are looking for how they all look alike"... repeat the above procedure.

Turn to the next page, Item OO. "These pictures all look alike in some ways. How do they all look alike?"

Repeat subject's comments and ask, "Do you see any other ways they all look alike?"

"Now, turn the page. Look at these pictures carefully...(pause) .... Which one of these pictures looks most like the pictures you have just seen?" (A) "Circle the letter "A" after Item 00 on your answer sheet."

There are twenty items in the test, just like these we have just done. Each one has a page with six pictures. Look at the pictures carefully and think about how they all look alike. Then turn the page and choose one picture which you think looks most like the six pictures you have just seen. For each item, circle the answer on your answer sheet."

"Are there any questions about how to take the test...(pause)... Turn the pages when you feel ready, and work all of the items to Item 20. Look at the pictures carefully, you may not turn a page back after it has been turned. You may begin."

If Tape Recording:

For each item, when the subject turns to a CDS, say, "Item ___, How do these pictures all look alike?" Following each response, ask, "Do you see any other ways they all look alike?" or "Anything else?"

For each GSS, ask, "Which of these pictures look most like the pictures you have just seen? Circle your answer on the answer sheet."

Record subject's name, test items discussed, and the beginning and ending number on the tape counter.

APPENDIX V

VISUAL CONCEPT FORMATION TEST PROTOCOL

For each test administration the Visual Concept Formation Test booklet, an answer sheet, a pencil, and two blank 4" X 5" cards must be provided.

Introduce the test administration as follows:

"You have seen all of these pictures before, in the other test. This time they are arranged differently and the test will be done in a different way."

"First, please fill out the top line of the answer sheet."

Open the book to Item 0 and direct the subject as follows:

"This time I want you to take these two cards"...(place cards onto pictures "E" and "F")..."and put them on two pictures like this. Seven of these pictures look alike in some way. I want you to cover two pictures, so that all the pictures not covered look alike."... remove the two cards..."Where would you put the cards on this page?"

The test administrator will mark the answer sheet during this test. Take the answer sheet and pencil and, as the subject places the cards, circle the appropriate letters on the answer sheet.

On Item 0 the subject should cover "C" and "G." If not, ask the subject to tell how all the pictures not covered by cards look alike.

Direct the subject's attention to critical attributes until "C" and "G" are covered.

On Item 00 the subject should cover "E" and "I." If not, ask the subject to tell how all the pictures not covered by cards look alike. Direct the subject's attention to critical attributes until "E" and "I" are covered.

Following Item 00, direct the subject as follows:

"There are twenty items just like these two we have just done. On each page, cover two pictures so that all the pictures not covered look alike in some way. You may move the cards around until you're sure, but on each page have seven pictures which all look alike when you finish."

"Are there any questions about how to take the test"...(pause)....

"Turn the pages whenever you feel ready and work all of the items to Item 20. I will be marking your choices on your answer sheet. You may begin."

Following these instructions, there should be no dialogue between the subject and the test administrator.